

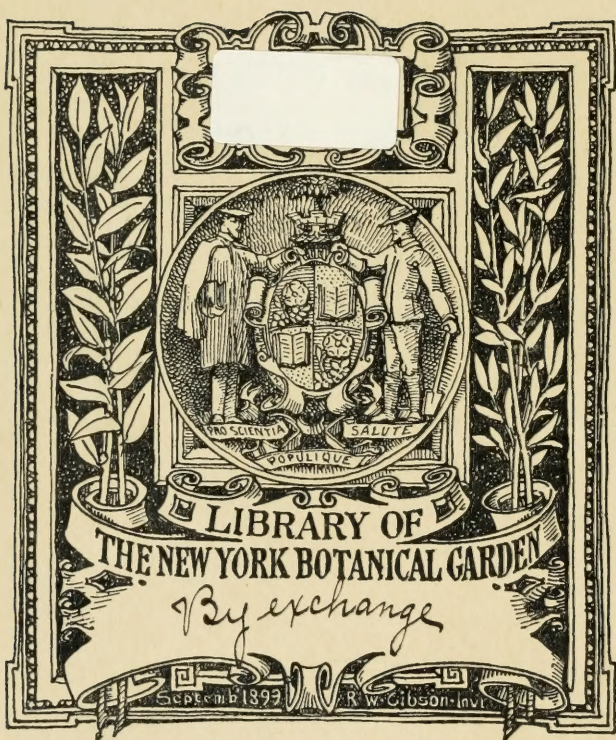
ANNUAL REPORT

NEBRASKA

State Horticultural Society

1909

L. M. RUSSELL







FORTIETH ANNUAL REPORT

OF THE

Nebraska State Horticultural Society

Containing all the Proceedings of the Summer Meeting Held at
Falls City, July 21 and 22, 1908, and the Annual
Meeting Held at Lincoln, January
19, 20 and 21, 1909.

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By **L. M. RUSSELL**, Secretary
Lincoln, Nebraska

LINCOLN, NEB.
Published by the State
1909



LETTER OF TRANSMITTAL.

To His Excellency, Ashton C. Shallenberger, Governor of Nebraska:

SIR:—In compliance with legal requisition, the annual report of the Nebraska State Horticultural Society for the year 1909 is respectfully submitted.

L. M. RUSSELL,

Secretary Nebraska State Horticultural Society.

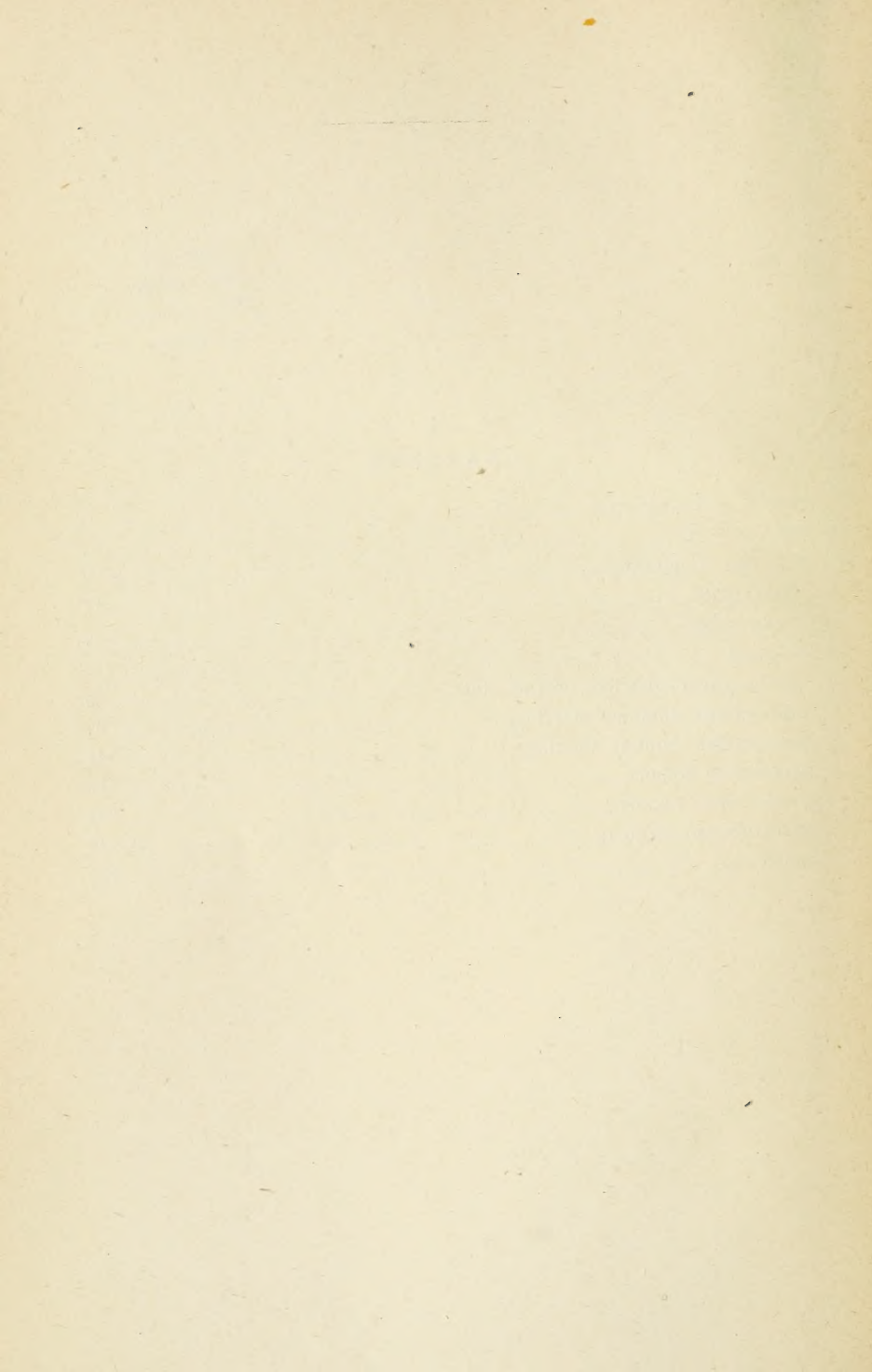
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JUL 26 1915



OFFICERS.

President.....Chas. L. Saunders, Omaha
First Vice-President.....C. H. Green, Fremont
Second Vice-President.....J. D. Ream, Broken Bow
Treasurer.....Peter Youngers, Geneva
Secretary.....L. M. Russell, Lincoln

DIRECTORS.

For one year.....J. A. Yager, Fremont
For two years.....A. J. Brown, Geneva
For three years.....G. A. Marshall, Arlington

STANDING COMMITTEES OF THE SOCIETY.

SYNONYMS.

A. J. Brown, Geneva,

C. H. Barnard, Table Rock,

G. A. Marshall, Arlington.

METEOROLOGY.

Prof. G. D. Swezey, Lincoln.

ENTOMOLOGY AND ORNIHTOLOGY.

Prof. L. Bruner, Lincoln.

VISITING COMMITTEE TO THE UNIVERSITY OF NEBRASKA

EXPERIMENT STATION.

E. F. Stephens, Crete.

GEOLOGY.

Prof. E. H. Barbour, Lincoln.

FORESTRY.

Prof. E. T. Hartley, Lincoln.

VEGETABLE CULTURE.

Prof. R. A. Emerson, Lincoln.

ORNAMENTAL GARDENING.

J. H. Hadkinson, Omaha.

FLORICULTURE.

Ed Williams, Grand Island,

L. Handerson, Omaha,

C. H. Green, Fremont.

LEGISLATION.

Peter Youngers, Geneva,

L. C. Chapin, Lincoln,

C. H. Barnard, Table Rock.

MEMBERSHIP, 1907.

HONORARY LIFE MEMBERS.

Beach, Prof. S. A.	Ames, Iowa
Brackett, G. B.	Washington, D. C.
Bruner, Prof. L.	Lincoln
Burnett, Prof. E. A.	Lincoln
Campbell, G. W.	Delaware, Ohio
*Crounce, Lorenzo	Ft. Calhoun
Earl, P.	Postoffice unknown
Garfield, C. W.	Grand Rapids, Michigan
Greene, Wesley	Des Moines, Iowa
Hansen, Prof. N. E.	Brookings, South Dakota
Van Deman, H. E.	3630 13th St., N. W., Washington, D. C.
Van Houten, George	Lenox, Iowa

ACTIVE LIFE MEMBERS.

Adams, W. R.	Omaha
Albert, U. G.	Normal
Aldrich, Benton	Johnson
Aldrich, Karl	Johnson
Alexander, A. A.	Peru
Alexander, G. W.	Peru
Allen, George L.	Spicer, Oregon
Anderson, A. N.	Ong
Atkinson, J. E.	Pawnee City
Backes, H. J.	Humphrey
Banks, E. H.	Lena
Barnard, C. H.	Table Rock
Beltzer, L. A.	Osceola
Bessey, Charles E.	Lincoln
Bentz, P. J.	Woonsocket, S. D.
Bliss, D. C.	Minden
Blystone, W. J.	33d & Dudley Sts., Lincoln
Bowers, W. B.	Postoffice unknown
Brown, A. J.	Geneva
Brown, Frank P.	Florence
Brown, J. L.	Kearney
Bruning, W. H.	Cedar Bluffs
Camp, Charles B.	Cheney
Card, F. W.	Sylvania, Pa.

*Deceased.

Carpenter, G. J.	Grand Junction, Colorado
Chapin, H. A.	Lincoln
Chapin, L. C.	Lincoln
Chowins, Chas. E.	Lincoln
Christy, G. S.	Johnson
Christy, S. W.	Glendora, Calif.
Colvin, W. E.	Postoffice unknown
Coppoc, J. L.	Chambers
Corbin, E. E.	Grand Island
Christ, J. W.	Box 761, Lincoln
Crawford, William	Postoffice unknown
Cross, F. B.	Asylum
Damrow, Chas. F.	Postoffice unknown
Davey, R. H.	Omaha
Davidson, J. R.	Aurora
Davies, William	Brownville
Davis, W. H.	Fullerton
De France, C. Q.	Postoffice unknown
Deweber, H. N.	Pawnee City
Dillon, J. W.	Greeley, Colo.
Dole, E. W.	Beatrice
Dovel, O. P.	Auburn
Dunkin, J. M.	Ravenna
Dugan, John	34 So. Logan Ave., Denver, Colo.
Dunlap, J. P.	Dwight
Dunlap, N. C.	Kearney
Emerson, R. A.	Lincoln
Erfling, E. C.	1150 Sherman Ave., Omaha
Ernst, C. J.	Omaha
Ernst, William	Tecumseh
Field, B. E.	Fremont
Field, R. B.	Fremont
Floth, Paul	Omaha
Fox, B. C.	Lincoln
Fredenburg, B.	Johnson
Frey, C. H.	Lincoln
Frey, H. H.	Lincoln
Frey, J. B.	Lincoln
Gage, J. A.	Beatrice
Gaiser, A.	Lincoln
Galbraith, G. B.	Fairbury
Ganson, L. A.	Kearney
Green, C. H.	Fremont
Green, Chas. Jr.	Fremont
Grennell, E. N.	Fort Calhoun
Gurney, C. W.	Yankton, So. Dak.
Hadkinson, J. H.	Benson
Harris, W. R.	Forest Grove, Oregon

MEMBERSHIP ROLL

13

*Harris, W. T.	Blackfoot, Idaho
Harrison, C. S.	York
Harrison, Harry S.	York
Harrison, W. A.	York
Hartley, E. T.	Lincoln
Heald, F. D.	University of Texas, Austin, Tex.
Heath, H. E.	R. F. D. No. 4, Box 114, Lincoln
Helin, J. F.	1612 Farnam St., Omaha
Henderson, Lewis	Omaha
Hess, Jacob	Omaha
Hesseltine, Ray W.	Peru
Hesser, W. J.	Pasadena, California
Hogg, J. A.	Shelton
Hornung, Ernest	Raymond
Howe, H. R.	Auburn
Hurlburt, C. M.	Fairbury
Jackson, T. C.	Purdum
Jenkins, W. F.	Arcadia
Jessup, J. G.	Clay Center
Kaar, Theodore	910 So. 13th St., Lincoln
Keyser, Val	Lincoln
Langdan, J. N.	Seward
Leonard, I. N.	Postoffice unknown
*Link, Harvey	Millard
Loghry, James	Geneva
Lundeen, N. P.	Alliance
Marshall, A. C.	Weeping Water
Marshall, G. A.	Arlington
Marshall, H. W.	Arlington
Marshall, C. G.	College View
Martin, Arnold	Du Bois
*Masters, J. H.	Syracuse
Masters, J. W.	Room 42, Brownell Block, Lincoln
Martin, F. R.	4622 Boulevard Ave., Omaha
McComb, H. A.	Postoffice unknown
McIntosh, H. F.	Alda
Meek, John	Unadilla
Meek, James	Talmage
Mellor, W. R.	Lincoln
Mergen, Philip	Omaha
Myers, M. E.	Broken Bow
Mohler, William	Walton, Kan.
Morsch, C. H.	Greeley Center
Mosher, D. C.	Colorado City, Colo.
Mosher, P. C.	Wilber

*Deceased.

Murphy, P. A.....	Exeter
Neff, J. G.....	Davey
Nemechek, Paul.....	Humboldt
Nownes, Charles.....	Papillion
Parker, C. B.....	Brock
Paulson, Paul	Omaha
Payne, Mrs. G. H....;	Omaha
Pearson, James.....	Denton
Perin, S. W.....	Lincoln
Perry, T. H.....	Elk Creek
Peters, R. C.....	4822 Cass St., Omaha
Peterson, Frank.....	Address unknown
Peterson, John.....	Postoffice unknown
Pollard E. M.....	Nehawka
Pollard, Isaac.....	Nehawka
Randell, J. C.....	Hamburg, Iowa
Ream, J. D.....	Broken Bow
Reed, M. H.....	Granada, Colo.
Reed, Mrs. J. H.....	Blue Springs
Riley, Alfred.....	Greeley, Colo.
Roberts, B. A.....	Albion
Roe, Erich J.....	Paddock
Rosenbaum, H. J.....	Kennard
Russell, D. L.....	Lincoln
Russell, J. D.....	Lincoln
Russell, J. M.....	Lincoln
Russell, L. M.....	Lincoln
Sandoz, Jules.....	(via Hoy Springs), Sandoz
Saunders, Chas. L.....	211 So. 18th St., Omaha
Schamp, L. D.....	Lincoln
Schumacher, A.....	York
Shroyer, J. O.....	Humboldt
Slayton, Geo. A.....	192Hillsdale St., Hillsdale, Mich.
Smith, E. E.....	Lincoln
Smith, H. C.	Falls City
Smith, H. L.....	Geneva
Smith, O. F.....	Blackfoot, Idaho
Stephens, E. F.....	Crete
Stephens, Frank G.....	Nampa, Idaho
Stevenson, J. W.....	North Bend
Stilson, L. D.....	York
Stouffer, B. R.....	Bellevue
Strand, G. A.....	Minden
Swayger, Chas. F.....	Cheyenne, Wyo.
Swan, J. T.....	Auburn
*Swan, W. G.....	Tecumseh

*Deceased.

Swezey, G. D.....	Lincoln
Tanahill, William.....	Postoffice unknown
Taylor, F. W.....	Denver, Colo.
Tiffany, M. D.....	Lincoln
Titus, G. N.....	Nemaha
Tracy, Chas. A.....	1523 Douglas St., Omaha
Van Metre, C. M.....	Valentine
Walker, J. W.....	Crete
Warren, G. F.....	Harvard
Watt, James.....	R. F. D. No. 5, Lincoln
Welch, G. L.....	Fremont
Wheeler, D. H.	Omaha
Whitford, C. A.....	Arlington
Williams, Ed.....	Grand Island
Williams, John.....	Tecumseh
Williams, L. O.....	University Place
*Williams, Theodore.....	Benson
Wilson, W. H.....	Postoffice unknown
Woods, A. F.....	St. Anthony Park, Minn.
Yager, J. A.....	Fremont
Youngers, Peter.....	Geneva

ANNUAL MEMBERS.

Barr, John F.....	Trumbull
Boliman, W. E.....	St. Libory
Barker, A. S.....	1300 Benton St., Lincoln
Cooney, B. W.....	Ogallala
Carse, J. F.....	1000 4th Ave., Council Bluffs, Iowa
Dickinson, Chas.....	Lincoln
Davidson, W. E.....	Holdrege
Davis, F. P.....	2732 E St., Lincoln
Denny, F. E.....	Lincoln
Ebright, Wm.....	North Platte
Edinborough, Phillip.....	Lincoln
Fritch, G. F.....	Ashland
Hall, S. R.....	R. F. D. 2, Havelock
Hansen, Alice W.....	Kimball
Hunter, David.....	Sutherland
Lasch, A. A.....	Lincoln
Nation, J. W.....	Fremont
Packwood, J. M.....	1345 A, Lincoln
Pritchard, H.....	Wisner
Simanton, J. R.	Falls City
Spelts, W. T.....	Grand Island
Vogel, P. G.....	Florence
Westgate, V. V.....	Lincoln
White, Geo.....	Haigler

*Deceased.

CONSTITUTION.

ARTICLE I.—Name.—This association shall be known as the Nebraska State Horticultural Society.

ARTICLE II.—Object.—This society shall have for its object the promotion of pomology, arboriculture, floriculture, and gardening.

ARTICLE III.—Membership.—The membership of this society shall consist of four classes, viz., active, associate, annual honorary, and life honorary. The active membership shall consist of persons practically engaged in fruit culture, forestry, floriculture, or gardening, who shall be admitted to life membership on the payment of a fee of \$5 at one time; to associate membership by the payment of a fee of \$1 annually. The honorary members shall consist of such persons as may be elected at any meeting of the society by a two-thirds vote of the members present, and shall have all the privileges and benefits of the society, except those of voting and holding office, which privileges shall belong exclusively to active members and to associate members who have been members of the society for twelve months and who shall have paid their second annual dues.

ARTICLE IV.—Officers.—The officers of this society shall be a president, first and second vice-presidents, secretary, treasurer, and board of directors of seven members, said board consisting of the officers enumerated in this article, excepting a secretary, and three additional members. The officers, with the exception of the secretary, shall be elected by ballot at the annual meeting of the society in January. The secretary shall be elected by the executive board. The term of office of these officers, with the exception of directors, shall be for a period of one year, commencing on the first day of June following. One director shall be elected at the January meeting, 1906, for one year, one for two years, and one for three years, and afterwards every year one director to serve three years.

ARTICLE V.—Duties of President.—It shall be the duty of the president to preside at all meetings of the society, appoint all committees not otherwise provided for, countersign all orders drawn on the treasurer by the secretary; in conjunction with the secretary he shall arrange all programs for the meetings of the society, and perform such other duties as the society or board of directors may require.

ARTICLE VI.—Duties of Vice-Presidents.—The vice-presidents shall superintend all exhibits of the society, and in case of vacancy in the office of president at any meeting of the society or board of directors shall perform all the functions of that office in the order of their rank.

ARTICLE VII.—Duties of Secretary.—The secretary shall keep an

accurate record of the proceedings of all meetings of the society and board of directors, draw all warrants on the treasurer, and keep an accurate record of the same as countersigned by the president, prepare for publication and edit all reports of the society requiring publication by the statutes of the state; in conjunction with the president prepare all programs and make all other necessary arrangements for all meetings of the society.

ARTICLE VIII.—Duties of Treasurer.—The treasurer shall be the custodian of all moneys belonging to the society, and shall pay from such funds all warrants drawn on him by the secretary and countersigned by the president.

ARTICLE IX.—Duties of the Board of Directors.—The board of directors shall have general management of all the affairs of the society, for which no specific directors are otherwise provided in the constitution and by-laws.

ARTICLE X.—Bonds of Officers.—The president and secretary shall each give a bond in the sum of \$5,000 and the treasurer in the sum of \$12,000 for the proper performance of his duties, which bond must be approved by the board of directors.

ARTICLE XI.—Salaries of Officers.—The president, vice-president, treasurer, and members of the board of directors shall receive such per diem per day for their services in attendance upon the meetings of the society as the society or board of directors may from time to time determine. The board of directors shall pay the secretary an annual salary of \$1,000 if they deem best, in consideration of his keeping an open office and giving his whole time to the work, spending at least eight hours a day in his office. It shall be his duty to put out each year a creditable annual report, issue monthly bulletins to each member, prepare articles at least once a month for the leading papers, doing also his utmost to secure new members. This is to be done with the advice and direction of the executive board.

ARTICLE XII.—Reports of Officers.—The president, secretary and treasurer shall each present an annual report in writing at the January meeting of all the business matters pertaining to their respective offices during the annual term expiring at that time.

ARTICLE XIII.—Meetings.—The society shall hold two or more meetings each year. The annual meeting shall be held in Lincoln on the third Tuesday in January, as provided by statute, and the other meetings shall be held at the same time and place as the annual exhibition of the Nebraska State Board of Agriculture.

ARTICLE XIV.—By-Laws.—By-laws not in conflict with the provisions of this constitution may be enacted by the society at any regular meeting.

ARTICLE XV.—Amendments.—The constitution may be amended at January meetings of the society by a two-thirds vote of the members present, such amendments having been presented in writing and read before the society at a session preceding the one in which the vote is taken.

BY-LAWS.

1. All the officers of this society shall be elected at the January meeting.

2. All officers of this society shall assume the duties of their respective offices on the first day of June following their election, and continue in office for the period of one year, or until their successors are elected and qualified.

3. The officers elected at the Januray meeting, 1895, shall hold their respective offices until the first day of June, 1896.

4. The amount allowed the secretary for express, postage and stationery shall not exceed \$150 per annum, and it shall be the duty of the board of directors to employ a competent stenographer to report the proceedings of the meetings of the society, whose fee shall be paid by the society.

5. The first business of the society shall be on each morning the reading of the minutes of the previous day's proceedings, and submitting the same to the approval of the meeting.

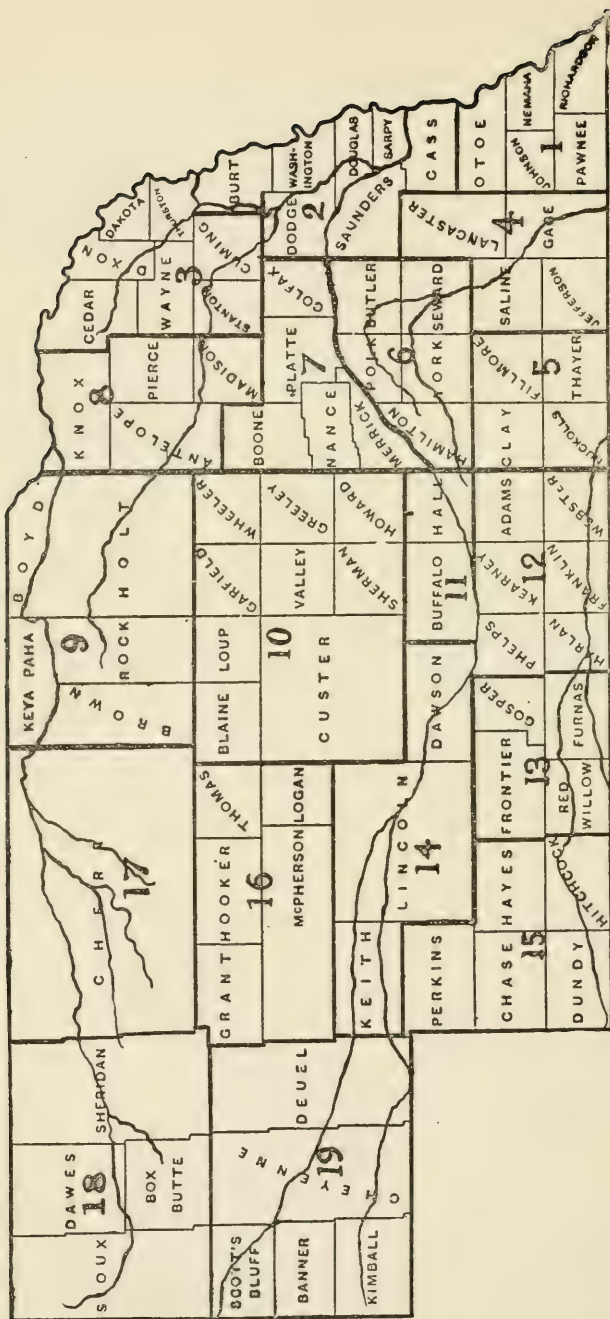
6. There shall be appointed by the borad of directors nineteen district directors, one from each horticultural district in the state.

Also a standing committee of three on synonyms.

Also a standing committee of one on each of the following:

Meterology in its relation to Horticulture, Entomology, Ornithology, Geology, Forestry, Vegetable Culture, and Ornamental Gardening.

7. These by-laws may be amended at any general meeting of the society by a majority of the members present.



Map Showing Horticultural Districts of the State.

HORTICULTURAL DISTRICTS OF THE STATE.

REPORT OF COMMITTEE ON REDISTRICTING THE STATE.

We, your committee to whom was referred the matter of redistricting the state and revision of the list of fruits and ornamentals recommended for general planting in Nebraska, beg to submit the following report:

For District No. 1, comprising Richardson, Nemaha, Otoe, Johnson, and Pawnee counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Cooper's Early White, Cole's Quince, Early Harvest, and Sweet June. For second choice we recommend Red Astrachan. Autumn—Wealthy, Maiden's Blush, Famuse, Dyer, and Warfield. Winter—Grimes' Golden, Winesap, Jonathan, Gano, Ben Davis, Salome, N. W. Greening, Missouri Pippin, and Virginia Beauty.

BLACKBERRIES: Snyder and Early Harvest.

CHERRIES: Early Richmond, Montmorency, and English Morello.

CRAB-APPLES: Whitney No. 20, Hyslop, and Siberian.

CURRENTS: Red Dutch, Victoria and White Grape.

GOOSEBERRIES: Downing, Houghton, Industry, and Red Jacket.

GRAPES: Concord, Worden, Moore's Early, Niagara, Moore's Diamond, and Woodruff Red.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Heath Cling, Salway, and Wright.

PEARS: Kieffer, Bartlett, Sheldon, and Seckel.

PLUMS: American—Forest Garden, Wild Goose, and Wyant. Japanese—Abundance and Burbank.

RASPBERRIES: Cumberland, Kansas, Gregg, Nemaha, Turner (Red) and Cardinal (Purple).

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Gandy, and August Luther.

For District No. 2, comprising Cass, Sarpy, Douglas, Washington, Burt, Dodge, and Saunders counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Yellow Transparent, Cole's Quince, Dyer, Sweet June, Red Astrachan, Red June, Chenango, Strawberry, Early Pennock, Early Harvest, American Summer Permain, Benoni, and Summer Hagole. Autumn—Wealthy, Utter's Red, Maiden's Blush, Ramsdell Sweet, Fulton Strawberry, Flora Belle, Plumb's Cider, Famuse, Warfield, Porter, Fulton, and McMahon's White. Winter—Ben Davis, Gano,

Winesap, Windsor, Jonathan, Grimes' Golden, Janet, N. W. Greening, Salome, Ingram, Black Twig, and Ishman Sweet. For second choice we recommend Missouri Pippin and Iowa Blush.

APRICOTS: Alexis, Budd, and Moorpark.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTS: Victoria, Cherry, White Grape, Fay's Prolific, and North Star.

GOOSEBERRIES: Downing, Houghton, and Champion.

GRAPES: Concord, Worden, Moore's Early, Agawan, Brighton, etc.

PEACHES: Russell, Champion, Bokara, and Wright for general planting in Cass and Sarpy counties, and for trial in balance of district.

PEARS: Kieffer, Flemish Beauty, Sheldon, Duchess, and L. B. DeJersey.

PLUMS: American—Wild Goose, Wyant, Wolf, Stoddard, Hawkeye, DeSoto, Forrest Garden. European—Lombard, Shippers' Pride, Green Gage, Shrop, and Damson. For trial, Japanese—Burbank, Abundance and Wickson.

RASPBERRIES: Nemaha, Kansas, Palmer, and Cumberland.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Sample and Warfield.

For District No. 3, comprising Stanton, Thurston, Wayne, Dakota, Dixon, and Cedar counties, we recommend the following for general planting:

APPLES: Summer—Duchess and Yellow Transparent. For second choice Red Astrachan and Sweet June. For trial, Summer—Hagloe. Autumn—Wealthy, Utter's Red, Flora Belle, Famuse, and Ramsdell Sweet. For second choice, Maiden's Blush and Plumb's Cider. For trial, Warfield and McMahon's White. Winter—First choice for entire district, N. W. Greening, Salome and Janet. First choice for south half of district, Ben Davis, Gano, and Winesap. Second choice for entire district, Iowa Blush and Missouri Pippin. For trial, Windsor.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, and English Morello. For trial, Terry, Baldwin, and Ostheim.

CURRENTS: Victoria, White Grape, Cherry, and Fay's Prolific.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

GOOSEBERRIES: Downing, Houghton, and Champion.

GRAPES: Concord, Worden, Moore's Early, and Pocklington. For trial, Brighton, Agawan, and Moore's Diamond.

PEACHES: Alexander, Triumph, Champion, Bokara, and Wright for trial only.

PEARS: Kieffer, Flemish Beauty, Sheldon, Duchess, and L. B. DeJersey for trial only.

PLUMS: American—Wyant, Wolf, Wild Goose, Forest Garden and DeSoto. European—Lombard, Shipper's Pride, and Green Gage. First choice for south half of district, Wild Goose. For trial in entire district, Japanese—Burbank and Abundance.

RASPBERRIES: Nemaha, Kansas, Palmer, Columbia, and Cumberland.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Sample, and Warfield.

For District No. 4, comprising Gage, Jefferson, Saline, and Lancaster counties, we recommend the following for general planting:

APPLES: Summer—Yellow Transparent, Duchess, Cooper's Early White, Early Harvest, Red June, and Sweet June. Autumn—Wealthy, Maiden's Blush, Famuse, and Utter's Red. Winter—Ben Davis, Gano, Winesap, Jonathan, Grimes' Golden, Missouri Pippin, and N. W. Greening.

BLACKBERRIES: Snyder and Early Harvest.

CHERRIES. Early Richmond, Montmorency, and English Morello.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, Martha, Red and Yellow Siberian.

CURRANTS: Red Dutch, Victoria, and White Grape.

GOOSEBERRIES: Downing, Houghton, and Industry.

GRAPES: Concord, Worden, Moore's Early, and Niagara.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Heath's Cling, Salway, and Wright.

PEARS: Duchess, Flemish Beauty, and Seckel.

PLUMS: American—Wyant, Hawkeye, Wild Goose, and Forest Garden. Japanese—Burbank.

RASPBERRIES: Kansas, Palmer, Gregg, and Turner.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, and Gandy.

For District No. 5, comprising Thayer, Nuckolls, Fillmore, and Clay counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Cooper's Early White, Cole's Quince, Early Harvest, Red June, and Sweet June. Autumn—Maiden's Blush, Wealthy, Famuse, Dyer, and Warfield. Winter—Ben Davis, Gano, Winesap, Jonathan, Grimes' Golden, Janet, and Missouri Pippin.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTS: Cherry, La Versailles, Victoria, Prince Albert, London Market, Red Dutch, and White Grape.

DEWBERRIES: Lucretia.

JUNEERRIES: Dwarf.

GOOSEERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Duchess, Agawam, and Brighton.

PEACHES: Amsden, Alexander, Hale's Early, Early Rivers, Russell, Cooledge, Champion, Triumph, Heath Cling, Wright, Smock, and Hill's Chili.

PEARS: Flemish Beauty and Barlett.

PLUMS: American—Wild Goose, Minor, Forest Garden, Wolf, Wyant, DeSoto, and Hawkeye. European—Lombard.

RASPBERRIES: Kansas, Palmer, and Nemaha.

STRAWBERRIES: Senator Dunlap, Clyde, Bederwood, Crescent and Warfield.

For District No. 6, comprising Seward, Butler, Polk, York, and Hamilton counties, we recommend the following for general planting:

APPLES: Summer—Yellow Transparent, Early Harvest, Cooper's Early White, Red June, Duchess, Summer Queen, and Sweet June. Autumn—Wealthy, Maiden's Blush, Utter's Red, Patton's Greening, Wolf River, Peerless, and Snow. Winter—Winesap, Missouri Pippin, Ben Davis, N. W. Greening, Janet, Salome, Walbridge, Ingram, M. B. Twig, Gano, Jonathan, Iowa Blush, Grimes' Golden, York Imperial, Minkler, and Rome Beauty.

APRICOTS: Russian.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Dyehouse, Large Montmorency, English Morello, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, Martha, Golden Beauty, Hyslop, and Transparent.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

DEWBERRIES: Lucretia.

JUNEERRIES: Dwarf.

GOOSEERRIES: Downing and Pearl.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Wright, and Bokara.

PEARS: Flemish Beauty, Seckel, Duchess, and Lincoln.

PLUMS: American—Wyant, Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, and Hawkeye. European—Lombard, German Prune, and Tatge. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland, Kansas, Gregg, and Ohio.

RHUBARB: Linnaeus and Victoria.

STRAWBERRIES: Senator Dunlap, Warfield, Sample, Aroma, and Haverland.

For District No. 7, comprising Colfax, Platte, Boone, Nance and Merrick counties, we recommend the following for general planting:

APPLES: Summer—Yellow Transparent and Duchess. For second choice, Sweet June. For trial, Summer Hagloe. Autumn—Wealthy, Utter's Red, Ramsdell Sweet. For second choice, Plumb's Cider, Flora Belle, Famuse, and Maiden's Blush. For trial, Warfield. Winter—Ben Davis, Gano, Winesap, Janet, N. W. rGeening. For second choice, Iowa Blush, etc.

APRICOTS: Fully as hardy as the hardiest peaches.

BLACKBERRIES: Unsuccessful except in damp seasons and favored localities. Snyder, and for trial, Stone's Hardy.

CHERRIES: Early Richmond, Montmorency, English Morello. For trial, Dyehouse, Baldwin, and Terry.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence and Martha.

CURRENTS: Victoria and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, and Pocklington. For second choice, Elvira. For trial, Moore's Diamond and Brighton.

PEACHES: Alexander, Triumph, Champion, Bokara, Russell, and Wright for trial.

PEARS: For trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. DeJersey.

PLUMS: American—Wild Goose, Wyant, Wolf, Forest Garden and Stoddard. European—Lombard, Shipper's Pride, and Green Gage. For trial, Japanese—Burbank and Abundance.

STRAWBERRIES: Senator Dunlap, Warfield, Crescent, and Beder-

RASPBERRIES: Nemaha, Kansas, and Palmer. Successful only in damp seasons or favored localities. wood. For trial, Sample and Splendid.

For district No. 8, comprising Madison, Pierce, Antelope and Knox counties, we recommend the following for general planting:

APPLES: Summer—Duchess and Yellow Transparent. For second choice, Red Astrachan and Tetofsky. For trial, Summer Hagloe and Sweet June. Autumn—Wealthy and Utter's Red. For second choice, Plumb's Cider, Flora Belle, Snow, Ramsdell Sweet, and Maiden's Blush. For trial, Warfield and McMahon's White. Winter—First choice for

entire district, N. W. Greening. To be added for south half of district, Ben Davis, Gano, and Winesap. Second choice for entire district, Iowa Blush, Missouri Pippin, and Walbridge. For trial in entire district, Windsor.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Montgomery, and English Morello. For trial, Terry and Baldwin.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence and Martha.

CURRENTS: Victoria and White Grape. For trial, Cherry, Fay's Prolific, and London Market.

PEACHES: For trial only, Alexander, Champion, Bokara, and Wright.

PEARS: For trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. DeJersey.

PLUMS: American—Wyant and Wolf, as first choice for entire district. Second choice for entire district, DeSoto, Forest Garden, and Stoddard. First choice for south half of district, Wild Goose. For trial in entire district, Burbank, Lombard, Shipper's Pride, and Green Gage.

RASPBERRIES: First choice for river counties and for trial in balance of district, Nemaha, Kansas, Palmer, Cumberland, and Columbia. For trial in entire district, Cardinal.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Bederwood, Splendid, and Crescent.

For district No. 9, comprising Holt, Boyd, Keya Paha, Brown and Rock counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Yellow Transparent, and Summer Hagloe. For trial, Red Astrachan. Autumn—Wealthy and Utter's Red. For trial, Maiden's Blush, and Plum's Cider. Winter—Salome, N. W. Greening, Janet, Iowa Blush, Winesap, Walbridge, and Ben Davis.

BLACKBERRIES: For trial only, Snyder.

CHERRIES: Early Richmond, Montmorency, English Morello and Terry.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTS: Victoria, White Grape, Cherry, Fay's Prolific, and London Market.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Pockington, and Moore's Diamond. Grapes should be covered in winter to insure success.

PEACHES: For trial only, Alexander, Champion, Bokara, and Wright.

PEARS: For trial only, Kieffer, Sheldon, Flemish Beauty, and L. B. DeJersey.

PLUMS: American—Wyant, Wolf, Stoddard, DeSoto, and Forest Garden.

RASPBERRIES: Kansas, Palmer, and Nemaha.

STRAWBERRIES: Senator Dunlap, Splendid, Bederwood, Crescent, Sample, and Warfield.

For district No. 10, comprising Howard, Greeley, Wheeler, Garfield, Valley, Sherman, Custer, Loup, and Blaine counties, we recommend the following for general planting:

APPLES: Summer—Yellow Transparent, Early Harvest, Cooper's Early White, Duchess, and Sweet June. Autumn—Wealthy, Maiden's Blush, Utter's Red, and Patton's Greening. Winter—Missouri Pippin, Ben Davis, N. W. Greening, Salome, Walbridge, Janet, Gano, Jonathan, Iowa Blush, and Grimes' Golden.

APRICOTS: Russian varieties.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, Martha, Golden Beauty, and Hyslop.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

DEWBERRIES: Lucretia.

JUNE BERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, and Wyoming Red.

PEACHES: Alexander, Triumph, Russell, Bokara, Hill's Chili, Crosby, and Wright.

PEARS: For trial only, Flemish Beauty, Seckel, Duchess, and Lincoln.

PLUMS: American—Wyant, Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, and Hawkeye. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland, Kansas, Gregg, and Ohio.

RHUBARB: Linnaeus and Victoria.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Crescent.

For District No. 11, comprising Hall and Buffalo counties, we recommend the following for general planting:

APPLES: Summer—Yellow Transparent, Early Harvest, Cooper's Early White, Red June, Duchess, and Sweet June. Autumn—Wealthy, Maiden's Blush, Utter's Red, Patton's Greening, Wolf River, and Snow. Winter—Winesap, Missouri Pippin, Ben Davis, N. W. Greening, Janet, Salome, Walbridge, M. B. Twig, Gano, Jonathan, Iowa Blush, Grimes' Golden, and York Imperial.

APRICOTS: Russian variety.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, Martha, Golden Beauty, and Hyslop.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

DEWBERRIES: Lucretia.

JUNE BERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Russell, Champion, Crosby, Hill's Chili, Wright, and Bokara.

PEARS: For trial only, Flemish Beauty, Seckel, Duchess, and Lincoln.

PLUMS: American—Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, and Hawkeye. European—Lombard, German Prune. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland and Kansas.

RHUBARB: Linnaeus and Victoria.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Bederwood.

For District No. 12, comprising Adams, Webster, Franklin, Kearney Phelps, and Harlan counties, we recommend the following for general planting.

APPLES: Summer—Yellow Transparent, Early Harvest, Cooper's Early White, and Duchess. Autumn—Wealthy, Utter's Red, and Plumb's Cider. Winter—Winesap, Missouri Pippin, Ben Davis, N. W. Greening, Salome, Gano, Jonathan, Iowa Blush, Grimes' Golden, and Janet.

APRICOTS: Russian.

ASPARAGUS: Conover's Colossal and Palmetto.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, Large Montmorency, English Morello, Baldwin, Dyehouse, and Ostheim.

CRAB-APPLES: Whitney No. 20, Florence, and Martha.

CURRENTS: Victoria, Cherry, Versailles, White Grape, Witch Dutch, and Fay's Prolific.

DEWBERRIES: Lucretia.

JUNE BERRIES: Dwarf.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord, Worden, Moore's Early, Elvira, Niagara, Wyoming Red, and Pocklington.

PEACHES: Alexander, Early Rivers, Triumph, Hale's Early, Champion, Crosby, Hill's Chili, Wright, and Cooledge.

PEARS: For trial only, Flemish Beauty, Seckel, and Kieffer.

PLUMS: American—Wyant, Wolf, Weaver, DeSoto, Forest Garden, Stoddard, Cheney, Hawkeye, Wild Goose, Robinson, and Pottawattamie. Japanese—Burbank and Wickson.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Aroma, Haverland, and Crescent.

For District No. 13, comprising Furnas, Gosper, Frontier, and Red Willow Counties, we recommend the following for general planting:

APPLES: Summer—Duchess and Cooper's Early White. Autumn—Wealthy and Maiden's Blush. Winter—Winesap, Missouri Pippin, Janet, Ben Davis, and Gano.

APRICOTS: Russian.

CHERRIES: Early Richmond, Dyehouse, Large Montmorency, and English Morello.

CRAB-APPLES: Whitney and Florence.

CURRENTS: Victoria, Cherry, Versailles, and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Concord and Elvira.

PEACHES: Alexander, Early Rivers, Hale's Early, Triumph, Russell, Champion, Hill's Chili, and Wright.

PEARS: For trial only, Seckel, Sheldon, and Flemish Beauty.

PLUMS: American—Forest Garden, Hawkeye, and Minor. Japanese—Burbank.

STRAWBERRIES: Bederwood, Warfield, Crescent, and Senator Dunlap.

For District No. 14, comprising Dawson, Lincoln, and Keith counties, we recommend the following for general planting:

APPLES: Summer—Duchess, Early Harvest, and Yellow Transparent. Autumn—Wealthy and Utter's Red. Winter—Ben Davis, Winesap, Janet, Missouri Pippin, and Jonathan.

BLACKBERRIES: Snyder.

CHERRIES: Early Richmond, English Morello, and Montmorency.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTS: Red Dutch, Victoria, and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Moore's Early, Worden, Elvira, and Concord.

PEACHES: Alexander, Early Rivers, Champion, Crosby, and Wright.

PLUMS: American—Wyant, DeSoto, Forest Garden, and Hawkeye. European—Lombard.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Senator Dunlap, August Luther, Splendid, Bederwood, and Crescent.

For District No. 15, comprising Hitchcock, Hayes, Perkins, Chase and Dundy counties, we recommend the following:

APPLES: Summer—Duchess and Yellow Transparent. Autumn—Wealthy, Utter's Red, and Famuse. Winter—N. W. Greening, Ben Davis, Gano, Janet, and Winesap.

ASPARAGUS: Conover's Colossal.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse.

CRAB-APPLES: Whitney, Hyslop, Florence, and Martha.

CURRANTS: Red Dutch, Victoria, Cherry, and White Grape.

GOOSEBERRIES: Downing and Houghton.

GRAPES: Moore's Early, Worden, Elvira, and Concord.

PEACHES: Alexander, Early Rivers, Russell, Hill's Chili, and Wright.

PLUMS: American—Forest Garden, Hawkeye, Wolf and DeSoto.

RHUBARB: Linnaeus.

STRAWBERRIES: Bederwood, Warfield, Crescent, and Senator Dunlap.

For District No. 16, comprising Logan, Thomas, Hooker, McPherson, and Grant Counties, we recommend the following for general planting:

APPLES: Summer—Duchess. Autumn—Wealthy. Winter—Walbridge, Iowa Blush, and N. W. Greening.

CHERRIES: Early Richmond and Montmorency.

CRAB-APPLES: Whitney, Hyslop, Florence, and Martha.

CURRANTS: White Grape, Victoria, and Cherry.

GOOSEBERRIES: Houghton.

GRAPES: Concord.

PLUMS: American—Stoddard, Cheney, DeSoto, Forest Garden, Wolf, and Wyant.

For District No. 17 Cherry county, we recommend the following for general planting on dry land with good care:

APPLES: Summer—Duchess. Autumn—Wealthy.

Any varieties recommended for Districts 3, 8, or 9 will do well in most places in District 17.

CHERRIES: Early Richmond, Montmorency, English Morello, and Dyehouse. For trial, Early Morello and Terry.

CRAB-APPLES. Whitney No. 20, General Grant, and Virginia.

CURRENTS: White Grape, Victoria, and London Market.

GOOSEBERRIES: Houghton.

PEACHES: Alexander and Wright.

PLUMS: American—Wyant, Stoddard, Cheney, and Hamer.

STRAWBERRIES: Crescent, Bederwood, and Warfield.

For District No. 18, Comprising Box Butte, Dawes, Sioux, and Sheridan counties, we recommend the following:

APPLES: Summer—Duchess and Wealthy, with good care. Any varieties recommended for Districts 3, 8, and 9, will do well in most places of District 18, under irrigation.

CHERRIES: Early Richmond, English Morello, Montmorency, Dye-house, and Terry.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, Martha, and Transcendent.

CURRENTS: Victoria, White Grape, White Dutch, and Red Dutch.

GOOSEBERRIES: Houghton.

PEACHES: Alexander and Wright.

PLUMS: American—Wyant, Stoddard, Cheney, and Hamer. European—Lombard and Shipper's Pride.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Senator Dunlap, Sample, Warfield, Bederwood. Splendid, and Crescent. *

For District No. 19, comprising Duel, Cheyenne, Scott's Bluff, Banner, and Kimball counties, we recommend the following for general planting:

APPLES: Summer—Duchess,* Yellow Transparent, and Cooper's Early White. Autumn—Wealthy. Winter—Ben Davis, Gano, Janet, Grimes' Golden, Iowa Blush, and N. W. Greening.

CHERRIES: Early Richmond, Montmorency, and English Morello.

CRAB-APPLES: Whitney No. 20, Hyslop, Florence, and Martha.

CURRENTS: Red Dutch, Victoria, and White Grape.

GOOSEBERRIES: Downing, Houghton, and Smith's Improved.

GRAPES: Concord and Moore's Early.

PEARS: Flemish Beauty, Bartlett, and Kieffer.

PLUMS: American—Forest Garden, Wolf, Pottawattamie, DeSoto, Cheney, and Stoddard.

RASPBERRIES: Cumberland and Kansas.

STRAWBERRIES: Warfield, Senator Dunlap, Brandywine, Gandy, and Crescent.

LIST OF ORNAMENTALS.

INCLUDING TREES, SHRUBS, ROSES, VINES, BULBS, ETC., WHICH
APPLIES TO THE ENTIRE STATE, EXCEPT WHERE
OTHERWISE SPECIFIED.

HARDY SHRUBS

Snowball.	Prunifolia.
Hydrangea Paniculata Grandiflora.	Golden Leaf (Aurea).
Syringa, all kinds.	High Bush Cranberry.
Weigelia, Variegated and Rosea.	Altheas.
Flowering Almond.	Caragana.
Lilac, all kinds.	Moss Acacia.
Spireas as follows:	Yucca Filamentosa.
Van Houtii.	Forsythia.
Arguta.	Purple Berberry.
Thunbergii.	Golden Leaf Alder.
Clossa Alba and Ruberea.	Tamarix Amaurensis.
Anthony Waterer.	Dogwood.
Bumalda.	Wahoo.
Billardii.	Rosa Rugosa.
	Bechtel Flowering Crab.

BULBS AND TUBERS.

Paeonias.	Dahlias.
Tulips.	Gladiolas.
Lilies.	Tuberose.

PERRENNIALS.

Phlox.	Iris.
Oriental Poppy.	Larkspur.
Columbine.	Foxglove.
Gaillardia.	Cannas.
Bleeding Heart.	Caladium.
Golden Glow.	

CLIMBERS.

American Ivy (Ampelopsis Quin- quefolia).	Trumpet Vine.
	Clematis.
Honeysuckles.	Bitter Sweet.
Wistaria.	

CLIMBING ROSES.

Crimson Rambler.	Prairie Queen.
White Rambler.	Baltimore Belle.
Wichuriana-Creeper.	

JUNE ROSES.

Harrison's Yellow.	Madame Plantier.
Persian Yellow.	

MOSS ROSES.

Luxembourg.	Glory of Mosses.
Crested Moss.	White Moss.

HYBRID PERPETUAL ROSES.

Alfred Colomb.	General Jacqueminot.
Anne De Diesbach.	John Hopper.
Margaret Dickson.	Ulrich Bruner.
Baron De Bonstetten.	Paul Neyron.
Mabel Morrison.	Magna Charta.
Prince Camille de Rohn.	Madame Chas. Wood.
Tom Wood.	Fisher Holmes.
Marshall P. Wilder.	Jules Margotten.
Coquette Des Alpe.	Mrs. John Lang.

WEeping TREES.

ThurLOW Weeping Willow.	Camperdown Weeping Elm.
Teas Weeping Mulberry.	Cut Leaf Weeping Birch.

ORNAMENTAL SHADE TREES.

Hackberry.	Russian Mulberry.
Sycamore (S. E. part).	Catalpa Speciosa (S. E. part).
Carolina Poplar.	American Linden.
European Mt. Ash.	White Birch.
Black Walnut.	Horse Chestnut (S. E. Part).
Butternut.	Sweet Chestnut (S. E. part).
Ash.	Russian Olive.
Soft Maple.	Oaks.
Elm.	Hard Maple (extreme east).

ORNAMENTAL HEDGE.

Berberry.	California Privet.
Japan Quince.	Tamarix.
Spirea.	

COMMON HEDGE.

Osage Orange.	Russian Mulberry.
Honey Locust.	

FOREST TREES.

Elm.	Honey Locust.
Ash.	Russian Mulberry.
Soft Maple.	Osage Orange.
Catalpa Speciosa.	Box Elder.
Walnut.	

EVERGREENS.

Black Hills Spruce
Pungens.
Englemon Spruce.
Douglas Spruce.
Concolor.

Ponderosa Pine.
Austrian Pine.
Scotch Pine.
White Pine (extreme east).
Balsam Fir.

Respectfully submitted,

G. A. MARSHALL, Chairman,
G. A. STRAND,
A. J. BROWN,
C. H. BARNARD,
W. G. SWAN,
G. N. TITUS,
E. F. STEPHENS,
H. S. HARRISON.
W. F. JENKINS,

Committee.

PROCEEDINGS

Proceedings of the summer meeting of the Nebraska State Horticultural Society, held at Falls City, Tuesday and Wednesday, July 21 and 22, 1908.

SUMMER MEETING

PROCEEDINGS.

The Summer meeting of the Nebraska State Horticultural Society convened at the Court House, Falls City, Tuesday, July 21st, 1908, at 10:00 A. M. The following program was carried out:

TUESDAY, JULY 21

9:30 A. M.

Invocation
Address of Welcome.....Mayor
Response.....President Saunders
Opportunities for Horticulture in Southeast Nebraska.....
.....G. S. Christy, Johnson
Flowers for the Farm.....C. S. Harrison, York
Music

2:00 P. M.

Music
Fifty Years in Nebraska.....W. G. Swan, University Place
A Few Flowers.....C. H. Green, Fremont
Rare and Hardy Shrubs and Flowers.....W. H. Bruning, Cedar Bluffs

EVENING SESSION, 8:00 P. M.

Music
The Home Beautiful and its Relation to Character Building.....
.....Hon. George Coupland, Elgin
Vocal Solo.....Miss Edna Crook
Horticulture in its Relation to Agriculture.....Dean E. A. Burnett, Lincoln
Music

WEDNESDAY, JULY 22.

9:30 A. M.

The United States Department of Agriculture and its Work.....
.....Hon. E. M. Pollard, Nehawka

Spraying for the Codling Moth and Apple Scab in Nebraska.....
G. E. Merrell, U. S. Department of Agriculture
 Report of Committees.....

The President: The regular summer meeting of the Nebraska State Horticultural Society will now come to order. On account of the lateness of the hour it has been suggested that we postpone our program until this afternoon and meet here at 1.30 instead of two o'clock. Since our program for this morning is not very heavy it seems that would be a good plan, and if there are no objections then we will convene here in this hall at 1:30 this afternoon and we stand adjourned until that time.

1:30 P. M.

The President: The meeting will now come to order. Reverend Bailey will pronounce the invocation.

INVOCATION.

Almighty God, our heavenly Father, we thank Thee for this auspicious day. And we thank Thee for this beautiful weather with which Thou art blessing us. We thank Thee for this society of men engaged in the good work they are doing. We thank Thee for the kindness which Thou has shown us and which is so manifest all around us.

We ask Thy blessing upon us and upon these men here who are interested in floriculture and horticulture. We thank Thee for what they have accomplished. May they continue to do more and may their efforts result in more good for mankind. May they bring forth new fruits and new flowers to beautify the earth. Bless the officers of this society. Give unto them and unto all of us increased wisdom and increased strength. May all that these men accomplish make for better conditions and more enjoyment of the good things with which Thou hast blessed us. May they enjoy themselves while in our city and may they have a very pleasant and profitable meeting.

Hear this our prayer we ask in Thy Son's name. Amen.

The President: We will now listen to the address of welcome to be delivered by Mr. Oliver, County Superintendent of Public Instruction.

Welcome.

County Superintendent, T. J. Oliver.

Mr. Chairman, Members of the Nebraska State Horticultural Society,
 Ladies and Gentlemen:

In the absence of our mayor, I have been called upon to make a few remarks in the way of welcoming you to our city. I want to say to you that Falls City and Richardson County as well does extend to you a very hearty welcome. We are glad to have you with us. We are glad to wel-

come you to this corner of the state of Nebraska, where we grow the finest fruit and the finest flowers, and the finest crops, and where we have the finest women and the best men.

We are glad to welcome you to our city, and we hope that your stay with us may be pleasant and profitable and that you will enjoy yourselves while you are here. Before you leave here we would like to have you go out into the surrounding country and see the finest farms and the finest orchards and the finest crops that can be grown in the state of Nebraska. We are glad to welcome you to this county. I have lived in Nebraska thirty years and I want to say that right here in old Richardson county we have the best there is. The soil everywhere is rich and productive of an abundant harvest. Richardson county has long been known, not only as the finest agricultural portion of the state of Nebraska, but of the whole world. There are no waste acres of land and it is all valuable. I remember as a boy, of studying the map of this country, and all this through here was combined as the Great American Desert, and in the earlier days people said it would always be worthless. As Horace Greeley said, "Go west young man,—go west and grow up with the country." Many of us did come west and have grown up with the country.

And I am particularly glad to welcome you to this county,—to this country that is flowing with milk and honey. Again I extend to you a most hearty welcome to Richardson County and to our city.

The President: I want to say to Mr. Oliver and the people of Falls City that the Nebraska Horticultural Society desires to thank them for the very cordial welcome they have extended to us and for the privilege of coming to this substantial and reliable county of Nebraska.

We are very glad to be with you and glad to be assured of this hearty welcome. We do not want any of you to think that we are engaged in a selfish work, but that we are here to help you more thoroughly enjoy life and the good things around us. This society is not made of salaried individuals and we do not have a large amount of money. We do get a small appropriation, however, from the state and this is used in spreading the news and information among the people. We are interested in the propagation of fruits and flowers,—in bringing out the best that is possible, in helping to make the home grounds and public grounds more beautiful and ornamental. This society is divided up so as to cover the whole state; we have the state divided into horticultural districts and in each district, so far as can, we carry on experiments and determine what is best in the line of fruits and flowers and trees. In this way we find out what is best adapted to each section of the country, and we are glad to give this information out to the people.

I want to say again that we are glad to be permitted to come into this part of the state and spread some of our doctrine. We are glad to be here, and hope you will get something from us, and also that our stay here may be very profitable to us.

Before taking up the first paper on the program, the society listened to two very enjoyable numbers by the Falls City orchestra.

The President: The first regular paper on the program this afternoon will be on the subject, "Opportunities for Horticulture in South East Nebraska," by Mr. Christy.

Opportunities for Horticulture in Southeast Nebraska.

G. S. Christy, Johnson.

There are at the present time many young men, who feeling that they cannot invest twelve to twenty thousand in a 160 acre farm and ever expect to pay for it, and believing that a farm of less dimensions is too small for a bread winner are drifting to the cities to become street car conductors, clerks, or street pavers at a living salary. But their pay checks are seldom large enough to leave any surplus, after the necessary and unnecessary month's expenses are paid. And the rule is to be in debt about half the amount of the check at the end of the month. The results are they seldom own a home. They soon learn to labor to put in time. And their highest ambition is to draw a pay check, already half spent. Every young man, with either brains or energy, should be at work for himself, if it is only to run a peanut stand. There are but few men who have lead honest, industrious lives than cannot obtain credit enough to get a hold on ten acres of land. And ten acres of land near some good shipping point in Southeast Nebraska, scientifically cared for, will support and keep busy an ideal **Roosevelt family**.

On ten acres one can not have a big apple orchard, in fact, I would not incumber so valuable land with apples, peaches, or pears. But for the surest crops and greatest returns per acre plant the small fruit. It always proves the big money maker.

Four acres of a ten acre farm should be planted to strawberries, Sen. Dunlap, Warfield, and a few other standard varieties are the ones to plant. Do not invest in the new and untried varieties that it requires pages of catalogues to describe their many virtues, and that sell at eight and ten times the price of the standard varieties. Then, too, buy from some responsible firm that will stand back of their guarantee if anything proves untrue to name. There is many a gold brick handed out in Nebraska in the form of nursery stock, but with so many reliable firms in the state it is the purchaser's own fault when he gets swindled. There is no more excuse for buying nursery stock from some transient salesman that comes along than there would be for depositing your money with every harvest hand that comes to town instead of putting it in a bank, backed and guaranteed by financially responsible citizens.

Four acres of strawberries will guarantee an income of better than four hundred dollars (\$400.00) per year, if the records of the last twelve years are to be relied upon.

Two acres of blackberries (Snyder) have in the same series of years exceeded one hundred dollars (\$100.00) per acre, properly cultivated and pruned. But they must be taken care of. One blackberry patch that has been let run wild for the same length of time has been like a wild boy scarcely worth the raising.

The raspberry has been the most uncertain crop of any of the small fruits. Yet the high price they command, and the occasional big crop makes a fairly good average for a series of years, and as they ripen between the strawberry and the blackberry, and they are a great assistance in holding customers through the season I would advise planting an acre of raspberries, Cumberland, in the black caps and Cardinals for red berries.

Then the balance of the farm can be divided up for garden, hen yard, and cow pasture. For hens, cows, and bees are a necessary adjunct to Horticulture, as you need the bidies to eat the bugs and worms that destroy the fruit.

What berry is in its proper element unless smothered in cream. And the busy bee will not alone add quantity to your fruit supply by aiding polinization, but they will also add to your income, and supply the family larder with wholesome sweets. In fact, ten acres of land can be made to bring a larger income than fifty per cent of the railroad men receive, more than ninety per cent of what our teachers are paid and more than any of our day laborers receive. And then you are your own boss, not subject to the dictates of a Hill or a Gould, neither to the caprices of some school board, nor an oppressive superintendent of works who measures his salary by the amount of extra work he can exact from his men. The days of strenuous labor will extend from March to September and you will have the balance of the year for recreation, and for improvement of mind and body and to enjoy home. A blessing you will seldom possess as a salaried man.

As to selecting fruit land it should always be high and well drained, a North slope for all berries. A South slope for grapes. An East slope for apples, and a West slope if you would be a bankrupt. Never select flat and low land for any of the berries, even the blackberry that delights in summer showers can not live with wet feet.

The opportunities are not alone to the man of limited means in South East, Nebraska but the capitalist may invest with assurance of big interest on his money. Every degree of latitude has its season for furnishing berries, and neither Texas, Oklahoma, nor South Missouri can monopolize the business. Twenty car loads at Falls City would sell for more money per case than though there are only two or three hundred cases grown.

Every town in Nebraska of one hundred people or more will use from twenty to several hundred cases of raspberries and blackberries. The market for them is almost unlimited, but it requires less application of brains and brawn to haul a load of hogs to town and take the price the buyer sees fit to give than it does to be your own salesman and make

your own market. Blackberries are the easiest grown and the easiest picked of any of the berries and the demand for them is growing every year, and I expect to see the blackberry acreage quadrupled in the near future. Pears are also in great demand and there are a few localities in which blight does but little damage. And in one of these favored sections I had rather own a pear orchard than either an apple or peach orchard. There are thousands of dollars spent for fruit every year that should come to this section of Nebraska. And the fruits that can be depended upon for better than one hundred dollars (\$100.00) per acre are Strawberries, and Blackberries.

Question: Mr. Christy, what do you consider the best variety of pear for southeast Nebraska?

Mr. Christy: For a good commercial variety I think the Kieffer is probably the best. This ground around here, though, is too rich for growing good pears. Further southeast of Falls City where the ground is rich, —black soil with some sand on top, is better. Most of this ground right around here is too rich though.

Question: Is there any particular way of taking care of pears to make them bear?

Mr. Christy. No, I think not. This idea of driving nails into trees, wrapping wire around them, etc., I do not think much of. The best way is to give them good care and cultivation and let them follow out the laws of nature. You cannot change the laws of nature in this way.

The President: I am sorry to have to announce that Mr. Harrison, of York, who was to have the next paper on our program, is not here with us, and for that reason we will have to pass on to the next subject, which is "Fifty Years in Nebraska," by Mr. W. G. Swan, of University Place.

Fifty Years in Nebraska.

W. G. Swan, University Place.

Mr. President and members of the horticultural society.—In November 1858, taking Horace Greely's advice I came west to grow up with the country. The Hannibal and St. Joe road was built to within three miles of St. Joe. We had a through ticket, but preferred to walk instead of waiting for them to finish the road. We took a stage for Rockport, Mo., at ten cents per mile and rode down the hills. We carried fence rails to pry the coach out of the mud in the ravines. Then we would walk up hill and ride down hill. We arrived at Rockport one or two days late. From Rockport we walked to Brownsville, eight miles, and were as far west as we cared to go.

Brownsville fifty years ago was the third city in the territory, doing an immense business and drawing trade from southeastern Nebraska and northwestern Kansas for over 100 miles. But voting bonds were their undoing and today she retains her former greatness in name only.

In those early days graft for government lands was invented on a small scale compared with that of recent date. The pre-emption was allowed each head of family one quarter section, but by surveying and staking out a town site 320 acres additional could be entered. One could ride for miles being in towns all the time with a farm now and then between the coming paper cities.

In those days our people were all on an equality, no millionaires having come west. Our menu was corn bread, hog and sorghum with the hog left out part of the time. But I am glad to say that Sunday mornings we had biscuits for breakfast which made it a day of feasting as well as of rest. It's astonishing the number of biscuits an average person could eat when the menu was changed. I can almost taste them yet.

Fifty years ago we raised corn, wheat, oats and potatoes, which we marketed on the Missouri river in summer and in St. Joseph, eighty miles away in the winter.

About this time horticulture was being talked about to change the menu on our table. The first trees came from Ohio by steamboat and stages, more dead than alive, but our fine climate and rich soil caused a few to grow and we started in our career as fruit growers about this time. Hon. J. H. Masters started a nursery at Nebraska City and we began to get trees that were alive. Governor Furnace, Hon. J. Sterling Morton and Dr. George L. Miller were then editing newspapers and kept pounding it into our people that we could raise enough fruit for home consumption.

But it was slow sledding for those pioneers to get the people started to raising fruit. Where there was one apple tree in the early sixties, now there are hundreds, and barring late frosts in the spring we can compete with any country on earth.

Then came the war with all its hellishness, and for a few years it was all we could do to keep soul and body together, having the Indians on the west, Jayhawkers on the south and east. It's a wonder our territory wasn't depopulated, as our young men were in the war. How the women and children kept alive is a mystery. Some women were chopping and hauling wood five and six miles to keep the fires going. I have often heard of times being so hard as to try men's souls, but I can't imagine how the women's souls felt at running the house and farm. But all things have an end, and the war finally ended. The boys in the east, weaned from home by service in the war, came flocking to Nebraska. Homesteads were cheap at \$14 a quarter and we began to encroach on the great American desert by leaps and bounds, until today, I believe we have the best housed, best clothed, best fed, prettiest women, braniest men and least illiteracy of any country. Why, sirs, even one of our citizens has designs on the white house. For all these blessings we surely ought to be thankful to the Giver of all good things.

In the last fifty years some wonderful changes have taken place. We have seen king corn dethroned and king alfalfa riding in triumph as the

staple crop. The hay and meal are being shipped to all parts of the world, and some of our people are crowding brome interests to the front. In fifty years we have seen the iron horse supplant the ox teams; we have seen the deer, antelope, buffalo, either exterminated or driven back to the Rocky mountains. In fifty years we have seen telephones, wireless telegraphy come, and electricity harnessed to draw cars and automobiles. The self binder, band cutter, straw stacker, two and three rowed corn planters, and a thousand other devices to lighten labor have been invented.

Looking back fifty fifty years it seems only a span, but in progress it's up to a thousand years preceding it in inventions, education, arts, etc. If we judge the future by the past fifty years, the mind can not imagine the strides that will come in the next fifty years.

We have had our ups and downs as might be expected in a new country, but I am safe in saying we have had more ups than downs, or our land would not have raised from \$1.25 an acre to \$75 and 2100 in 1908. In the fall of 1866 we had our first visitation of grasshoppers. Word came that they were where Lincoln now stands, and moving southeast at a rate of four or five miles a day, devouring every green thing. Some thought when they reached the Nemaha river they would be drowned and never reach the river counties, but one day about 1 o'clock something began to drop, and in an hour they filled the sky like a snowstorm.

Some places they seemed to be two or three deep and they seemed to want our crops, and we stood by and saw them taken. I had a flock of turkeys and when the grasshoppers began to fall the turkeys got busy but only for a short time as they got too full for utterance. It was funny to see them stand, and see so many grasshoppers go to waste. Again in 1874 they came, devastating the country. They deposited their eggs in the fall. Hatching out in the spring they ate everything within ten miles of the river and On July 1 they took wings and flew away, going where, nobody knows, but probably to some other planet.

We fought them with tar, coal oil, fire, but they were too numerous. A kind providence ordered them to move, and they went. We have had bed bugs, chintz bugs, fleas, lice, mosquitoes, wood ticks, dog ticks and politics. The combination as bad as it is, is not in it with a grasshopper scourge.

Referring to one of the above plagues, namely politics, while we were in the territory we were disfranchised from national politics, but had a delegate to congress who was allowed to speak but not to vote. The main attraction to go there and sit like a lump on a log was mileage and salary. Still it kept politics from going out of fashion until we became a state. The political parties were pretty evenly divided in our first election of J. Sterling Morton of Nebraska City and David Butler of Pawnee City were pitted against each other for governor. Morton was elected by eight votes, fraud having been found in Rock Bluff precinct in Cass

county. By throwing that out Butler was elected. Since that time we have been voting regularly as clock work.

Our first apples in Nebraska were free from worms. Nine-tenths of all the fruit was perfect, but in those days we had thousands of birds, quail, prairie chicken, ducks and geese, and we lived sumptuously on them until they were all gone. We now pay our money for spray pumps that cannot compete with our feathered friends in keeping the enemies of our fruit down.

In conclusion I would like to give you some experiences of the fifty years in Nebraska, but my paper is already too long, so I will give you but one of my introductions to buffalo wallers, as they were called in those days.

In December, 1858, one morning a gray wolf came between our stable and house (we had no barns those days) and my brother-in-law and I mounted horses and gave it a chase. There was a light snow on the ground, filling the draws, and we thought we had the wolf. I took a short cut across a draw to head him off, when my horse found a buffalo waller. He lit with his frone feet on the other bank and his hind part dropped straight down in the snow. The ice on my seat, being on such a slant, I couldn't hold it, and I went down, I guess to see what was the matter. The horse scrambled and finally got out with me holding to his tail. I have always thought I started to grow grey hair from that introduction, but maybe not.

The President: I am sure that we are all glad to hear Mr. Swan's paper, which gives the horticultural history of our state for the last fifty years. We can hardly realize that it is only within these fifty years that our state has grown up to be one of the great producing states of the Union.

I understand that Mr. Bruning, who was to give a talk on the subject of "Rare and Hardy Shrubs and Flowers" is not here but that he has sent a paper to be read before the Society. His paper is as follows:

Rare and Hardy Shrubs and Flowers.

W. H. Bruning, Cedar Bluffs.

At the request of some of our members I will write a few lines on flowers, but I want to say right now that this is not to be taken as an advertisement for I do not care to sell any plants or seed, but I do want to improve what we now have and get more new hardy flowers.

In my travels in the forests I find some new hardy flowers, that we can use to cross on some that we now have. I found a perennial, Snapdragon that is a beauty; it grows 2 to 3 feet high with a spike of flowers 16 to 18 inches long, each flower two inches long, $\frac{7}{8}$ of an inch in diameter, light purple color, blooms with the Peonies. And a perennial Verbena, that we can use to cross on our annuals. The lupin, also a perennial, red and very showey, the foliage is a silvery white. I found

some beautiful perennial Primroses. Some white some yellow, with flowers 3 inches in diameter. Some of the roots go down 3 feet in the ground, do not bear transplanting very good. Near the foot of Long's Peak in Colorado I find some choice Spireas and some double flowered thimble berry, a specie of Syringas, that are as pretty as our old Mockorange. And fine Heliotrope, white, and a profuse bloomer.

The wild Geranium, a perennial; why not improve it by crossing it on our house plants so that we can leave them out all winter? The anemones or blue wind flower of the Rockies, are very pretty and can be grown here.

The Gaillardias grow wild in a great many states and when we bring them here and cross them on our tame sorts, they make a very hardy flower and are fine for cut flowers.

I am very much interested in crossing and breeding up new hardy flowers, if we want to cross two plants that do not bloom at the same season we can hasten one by starting it in the house or retard one by taking it up and keeping the roots cool or dry. I have crossed the Shirley Poppy on the Oriental, by planting the Shirley in the house in the fall. I will now cross the Shasta Daisey on an Early wild Daisey to get it to bloom for Decoration Day.

The President: Mr. Henry C. Smith, of Falls City, who is interested quite extensively in orchards and horticulture in general in this section of the state, is with us and I am sure that we would like to hear a few words from him.

Mr. Smith: Ladies and Gentlemen:—I am almost entirely new to the horticultural business, although I am somewhat interested in the growing of apple orchards and seeing what can be done along that line. I simply wanted to be allowed to come here and meet with you and absorb information and learn from you all I can, and if you people can while you are here I would like to have you come out to our country and around here and see some of our orchards and farms.

You are all familiar with the horticultural products of Richardson County. One of my orchards is north of town here, and I think there is none better anywhere in the state.

Question: How is your crop this year, Mr. Smith? Will you have a full crop or not?

Mr. Smith: Well, I presume we will get sixty per cent of a crop. We are trying to spray these orchards just as the Government wishes the work to be done. We have now sprayed three times. Mr. Merrell, of the United States Department of Agriculture, will tell you of this spraying tomorrow. We have sprayed Yellow Transparent, Grimes' Golden, Ben Davis, and Winesap. One thing I want to know about, and that is the subject of pruning. It is a subject that I have never before heard any two members of this society agree on.

Mr. Richards: My experience in pruning was commenced in 1858,

in southern Ohio. In '79 I came to Richardson County, Nebraska, and in '82 I planted an apple orchard. This orchard was pruned severely, which I do not think is the proper method; and I would not prune year in and year out, but only as the orchard needed it. My experience has been that the best time to prune is not later than the 20th of May to the 1st of July.

The President. We have exhausted our program for this afternoon, and if there is nothing further a motion to adjourn will be in order. Meeting adjourned until 8:00 P. M.

EVENING SESSION, 8:00 P. M.

The President: The meeting will now please come to order. We are always very much pleased when any of our friends from the University are with us. Tonight Professor Burnett, who is Dean of the College of Agriculture of the University, is here and we will be very glad to hear from him.

Professor Burnett: Mr. Chairman, Members of the State Horticultural Society, Ladies and Gentlemen: I am very glad to be with you tonight and to be honored with a place on your program. While my work at the University is more particularly along the lines of Agriculture, nevertheless I am very much interested in Horticulture. I am interested in this society and am glad to see the increasing good it is doing for the people of the state. The purpose of this society in spreading horticultural knowledge and arousing more interest in this work is very commendable and worthy and the results being accomplished are beneficial to the whole state.

The Extension of Horticulture in Nebraska.

E. A. Burnett, Dean of the College of Agriculture, University of Nebraska.

Primarily the orchard and garden furnish the source of supply of a most necessary portion of the subsistence of every family, viz., vegetables and fruit. If we can not secure these fresh from our own garden and orchard, we are forced to use a much inferior and more expensive article in the form of canned goods. A proper knowledge of how to grow fresh vegetables and fruits would minister to the health and happiness of all those who are not now proficient in the art. From a purely economic point of view, there is every reason why the farmer should study these questions and should become so thoroughly familiar with methods of growing trees and fruits that he may be able to supply his family more generously than he will ever do if he does not raise them on the farm.

There are excellent reasons aside from economic ones why the farmer should learn how to grow choice fruits, shelter belts, and groves for his farmstead. This state has developed from its almost treeless condition, with its endless monotony of landscape, into one of rich farms with com-

fortable homes, or at least with the possibility of producing such homes. From a vast, treeless prairie have sprung farms and gardens and orchards, beautifying the landscape and yielding their bounteous harvests to the skill of the intelligent farmer. That there are so many such homes is proof of the natural resources of the country. That there are so few is proof of our neglect of these refining influences, and of our poverty of ideals in our endless struggle for material success.

It is true that pioneer conditions may often have prevented giving attention to the growing of fruits and trees and that failures have resulted from a lack of education or experience in these lines, but the great and fundamental difficulty seems to be that as a class we have no intelligent conception of what may be accomplished and no well-grounded knowledge of the principles which will bring success. Trees have been planted and possibly cultivated for a year or two and then left to shift for themselves, fighting grass and drought on the one hand and cattle and horses and hogs on the other. Between these and insect pests the tree claims planted by the early settlers and many of the groves set more recently have been short-lived.

But we have reached an era of better things. The leaders in pioneer horticulture represented in this Society have developed varieties hardy in the different regions of the state. Thorough cultivation has been advocated in all the drier regions, and pioneer planting has been done in most regions which can be used as a guide to future planting. This Society, through persistent labor, has acquired the knowledge which will successfully extend the fruit-growing belt until great areas of the state to the west and northwest now practically without fruit may have an abundance for their home use.

In this problem of extending the tree growing and fruit growing area, the horticulturist has been a pioneer in teaching the benefits of tillage to increase the water-holding power of the soil. Probably no single line of agricultural education at our University is of so great benefit to all the people as the study of the relation of tillage to plant growth. When these principles are understood, trees and fruits may be grown with safety where it would be quite impossible without it. Young orchards growing at the experiment station at North Platte have shown no effect of injury by drought under good cultivation, and many young orchards in the region seem to have an abundance of moisture under proper tillage, yet this is a region where to abandon tillage would probably result in disastrous drought. The writer has seen cottonwood trees at Sidney, Nebraska, part of which were under thorough tillage and others under irrigation without tillage. The growth and condition of the trees was all in favor of the tillage. I have also seen on a dry table-land north of Sidney black and honey locust, green ash and box elder, making splendid growth under clean cultivation and giving promise of making an effective windbreak within five years of planting if the clean cultivation is continued. The growth of forest trees at the experiment station at North

Platte, though still too young to give results, gives sufficient proof that by clean cultivation trees can be grown throughout all this region if the right varieties are planted.

Whatever neglect may have been excusable in the past relative to the growth of gardens and orchards and the beautifying of home surroundings, these arguments no longer have force. The increased value of our lands makes intensive methods necessary. Larger and more profitable crops must be raised. A higher standard of soil fertility must be maintained to pay dividends on these increased values. This means that old and wasteful systems must be done away with and new and more economical ones must prevail. Rotations of crops and a diversified agriculture must be followed, giving room for the garden, the orchard and the shelter belt, because they minister to the general good of the family and raise the whole standard of life upon the farm. The single crop system of cultivation leads inevitably to the waste of fertility until cultivation becomes unprofitable and methods are either changed or—the land is abandoned.

Over against this condition we have a most striking contrast when better methods are followed and where the idea of home building has been placed above the question of accumulating wealth. Experience teaches us that, after all, intensive methods and the production of the more perishable crops and a higher quality of farm products is more profitable than farming a larger number of acres by old methods. The western idea of farming has been to own large tracts of land and farm on an extensive scale. With the rise in values, young men are discouraged from attempting to buy such a farm. Horticultural practice teaches us how a profitable business may be conducted on a small area of land. This encourages land ownership as against either tenant farming or the desertion of the farm for the city. Five acres or ten acres rightly located and put under intensive methods of cultivation will support a family better and with more comfort and luxury than many Kinkaid homesteads of 640 acres. Then why should we not have more people living on these small farms and fewer in the tenement districts of the crowded cities? Why should not the farmer on his forty or eighty acres of land with fruit and poultry and a herd of dairy cows enjoy the life of the country as much as the city dweller who comes out for a few weeks of the heated summer enjoy the beauty and the broad expanse of the country as a corrective to the intense and artificial life of the city?

The development of artistic surroundings is not so much a matter of money as it is of scientific knowledge. The humblest farmhouse can have shade, flowers and fruit, if the owner has the desire for them and a little knowledge to assist him in his work.

The farmer is in better position than ever before to satisfy these finer senses and develop these more artistic tastes. The profits of his industry have made him reasonably independent. He can now secure varieties for almost any region of the state. Trees which are grown in local nurseries

or those known to be specially adapted to his region. He knows what cultivation is necessary to retain moisture and develop plant food, and in the selection of varieties he can secure the advice of experienced men who are acquainted with his region. With these facts before him he should not hesitate from fear of failure to succeed in his undertaking.

The aesthetic sense of the people must be cultivated to demand these better things. This appreciation will grow with the ability to gratify the desire. Still, we need teachers who shall go up and down through the land to preach the adornment of nature through trees and fruit and flower, to counteract the destruction through washed and wasted hillsides and torrential food.

The planting of forest trees is an economic policy which should be fostered by the individual, the state and the nation. A forest policy should be established which would plant the headwaters of the streams and the waste areas in the sand hills to trees for posts and other uses. These forests would hold the moisture which falls upon the land and check the sweep of winds, so that even though the rainfall is not increased by this method it will be better distributed and more completely utilized. In the southeastern part of the state it would seem easily possible, by planting the rougher hillsides to hardy catalpas, osage and black and honey locusts and probably other varieties to make them pay dividends in excess of their value of the land for farming purposes. Every hillside so planted helps to check the flow of the water towards the streams and to lessen or prevent the floods which are causing such enormous damage in this region. Ten or fifteen years should be sufficient for growing a crop of posts, and twenty-five years should grow railroad ties of the hardy catalpa. The value of these crops would probably net as much per acre as to use these hillsides for grazing or cropping purposes, and the dangers of soil washing would be almost wholly prevented.

The arguments for a practical agricultural education apply with special force to men and women engaged in horticultural pursuits. These lines of work are highly technical in their nature. They demand special training, which can only be secured through long, practical experience or through instruction from those having this special knowledge.

The School of Agriculture stands for advanced knowledge along all agricultural lines, and the Experiment Station is ever seeking for new facts to help in developing and extending the horticultural interests of the state. At the central station, orchards are being grown under different methods of treatment, viz., clean cultivation; cultivation with cover-crops for ripening the wood in autumn, growing trees with a regular crop also grown on the land, etc., etc. Varieties are being tested both of trees, small fruits and vegetables. An area of about ten acres is being parked and planted to study different families of ornamental trees and shrubs. At the North Platte station eighteen acres of forest timber is planted and the area will be considerably increased. Many varieties of trees are being used to determine the best varieties and the best combinations for plant-

ing. Small orchards of apples, peaches, plums and cherries are started, and a selected list of ornamental shrubs and hardy perennials are being grown under clean cultivation. This list will be materially increased next year. An effort will be made to determine what ornamental shrubs and hardy perennials can safely be planted by the farmers in the region to be grown under good farm conditions.

The University also attempts to maintain a high class of instruction in horticultural lines for all students desiring this instruction and makes this a part of the required work in the School of Agriculture. At the present time no adequate building is available for giving this instruction. The University hopes to ask the coming Legislature for a building to house the department of Horticulture, Agricultural Botany and Forestry. Such a building should be the equal of any building now on the grounds in architecture and construction and convenience for work. If fire-proof in construction it will cost about \$100,000. The request of the Regents from the last Legislature for a \$40,000 building failed to pass when the total appropriation was scaled and the building above mentioned should in my judgment be made the principal item in the request for permanent improvements by the University. When such a home is provided, the University should be able to provide instruction equal to that offered in any Western institution. Our University should be foremost in sending out young men and women trained in the practical problems of horticulture and in the aesthetic side of home building and this cannot be done without adequate facilities for instruction.

A line of education which might do much for the cause of country life and incidentally for the extension of horticulture is the promotion of nature study, school gardens and simple agricultural instruction in the country schools. If the teachers of the State could have the training which would give them the proper point of view relative to country life and the technical education to enable them to explain some of the similar agricultural questions to their pupils, being careful above all other things to inculcate in the mind of the child a love for the country and for rural institutions, we would see a wonderful change in the attitude of the farming class toward these things.

The school-garden is a well-developed feature of the German and other continental schools and many schools in this country. In Germany most of the teachers are men, who have practically a life tenure of office. They are given a large garden to be operated by the school to help out their meagre salaries. This garden furnishes the laboratory where any study of plant growth can be demonstrated, and these studies become a leading feature in the school. In America, where the school garden idea has been tried it has been universally successful in arousing the interest of the pupils in nature. In many city schools the children have continued to care for their little plat of ground after the school had closed for the summer, each pupil being anxious that his plat of land should present a good appearance when the teacher returned in the fall. Equal interest

has been shown in the purely ornamental features of school grounds, the growing of flowers and shrubs and ornamental trees. With such a universal interest among children in beautifying their school home, can it be doubted that the introduction of this feature into the rural school will stimulate intellectual growth and train the child of a true and abiding love for the country and to a desire to beautify the farm home by shade trees and ornamental plants and by surrounding that home with an air of harmony and fitness, of sympathy and grace, which indicate the subordination of the commerce of the farm to the higher purposes of life. This mania for material prosperity and poverty of appreciation of the beautiful in home surroundings have driven many farmers' children from the farm when a little appreciation, a little effort to secure this harmony of home surroundings, would have given far different results.

The farmers' clubs, debating societies and farmers' institutes furnish a most excellent opportunity to extend horticultural knowledge among the people. The men who are willing to devote themselves to such work should take advantage of every institute to get a discussion of these subjects. Plans should be developed simple enough so that the farmer can do the work easily and quickly without too much hand labor. Each member of this society should demonstrate to his neighbors that he has solved the problem for himself, by producing the choicest fruits and vegetables and that he is thoroughly up to date in all his methods of culture and of combating curculio, codling moth, bacterial diseases, etc., since his example will be more convincing than any amount of advice which he fails to follow on his own farm.

The President: We are now to be favored with a vocal solo by Miss Edna Crooks.

Miss Crooks sang "Ah, I Have Sighed to Rest Me," from *Il Trovatore*, and "Love Me and the World is Mine," which were enjoyed very much by those present.

The President: I am sure we are all pleased to have another of our University friends here this evening, and I know what he has to say will be of benefit to all of us. Hon. George Coupland, of Elgin, one of the Regents of the University of Nebraska, will speak on the subject, "The Home Beautiful and its Relation to Character Building." Mr. Coupland has long been an ardent admirer and enthusiast of things to help make the home more beautiful and enjoyable. Mr. Coupland.

The Home Beautiful and Its Relation to Character Building.

Hon. George Coupland, Elgin.

Mr. President and Members of the Horticultural Society:

I count it a very great pleasure to be with you today and to be permitted to take part in your program. It brings a satisfaction of an

intense kind, for my love of things horticultural has led me to observe the overlapping and intermingling that things agricultural and horticultural have. The relationship of the two is very close and the influence of that with which you as members of this association have to do, to my mind, has a vital and potent power in enabling the agriculturist to become an individuality possessing the ability to rightly understand his relations with the great natural kingdom as well as those of social life and its responsibilities. Hence with your permission I shall discuss, "The Home Beautiful and Its Relation to Character Building."

You may ask the question, "Why do you as a farmer consider that a relationship exists between what is so apparently material and that which we call in the abstract 'character'?" The latter, I take it to be, is merely the accretion of certain acts, which, becoming more and more of a uniform quality, are established, and we call it "character." Therefore anything that has a power to produce thoughts, acts or ideals which are of a high order, we must of necessity say is of vital importance to us, not merely as individuals, but as communities and states.

My observation has been—and this extends over a period since my boyhood days—that with which we are immediately surrounded exercises a most potent influence over us. It may be that we are involuntarily affected, and I think it is often true that imperceptibly that with which we are in close personal contact leaves an indelible impression upon our personal characters. We take on the coloring of those things that we see and hear. The food that our senses feed upon as a rule leaves its individual characteristic upon our personal life. Therefore I am led to say. How important it is that the environment of our senses should be of a kind to provide the necessary sustenance, not merely to keep alive, but to produce those qualities of life which have in mind the loftiest ideals!

That the plant, the flower, the tree lover have been of inestimable value to the human race to me is a certainty. So today I bring you a word of good cheer from the agricultural world and say to you from my very heart, how much your work is valued and appreciated and that the missionary of beauty and esthetic taste occupies a position that is unique in the land. To be the producer, the lover, the distributor of things attractive that enable us to make home beautiful, is to be the furnisher of that which exerts over personal character an influence for exalted things.

The particular phase of the subject I have chosen upon which to say a few words relates more especially to the country home. In our own particular state we might appropriately call it the home of the multitude, for, as we all know, country homes in this state are the most numerous. For many years the trend of the life and thought, especially in our own land, has been toward the great centers of population. All roads, whether material or sentimental, seem to lead there. A kind of Roman centralization of materiality and sentimentality, and what culture and lofty idealism existed in the country, was caught up in this whirlwind and

deposited in these centers. Sometimes I think if it had not been for the natural amility of the rural surroundings to perpetuate and keep alive the loftier sentiments of the race, the cities and towns of our lands would have gone to the dogs. Recent years have developed the idea that the country is not merely to be looked upon as the breeding ground to furnish the great centers with the stalwart life of muscle and brain, but that it is the true home and natural habitat of refinement and culture. That in the home surrounded in the distance with fields of waving grain, maize and beautiful meadows scattered over with sleek and graceful stock, and it may be nestling beneath some sheltered nook adorned with trees of varied hues and style of growth, in such a rose-embowered home the fortunate owner lives, with the birds singing their songs of praise and contentment. It is amidst such surroundings that life has the fullest provision made for expansion. The motive power for material ability being thus multiplied and intensified, personal character and attainment cannot help being stimulated and improved. It may seem somewhat paradoxical to say that out of the sentimental comes that which gives the greatest material ability and yet it is by our material surroundings that the sentimental side of us is strengthened. I fully believe that the man who is surrounded with an environment such as I have just described will succeed in a material sense much more than the man who is content to allow his hogs and cattle to run up close of his front door. The person who loves order and who intelligently observes the wonderful arrangement of order in the natural world, becomes orderly in his daily life. The man who loves beauty and symmetry and who revels in the fragrance of God's laboratory will be likely to exude a sweetness in his intercourse with his family and fellowmen and show a certain symmetry of life and character, and, as the ever and inevitable developing plan of life goes on, his conception of life and its meaning, together with his individual responsibility, will be very likely to impress him deeply.

For many years, in fact, almost since I was able to think and observe, the personality of the tree and flower lover has left a deep impression upon me, and often when I have come into meetings similar to this, and met in a more individual way people whom we might generalize under the term Horticulturist, I have felt a standing-out of their personalities. There is an indefinable something that is always most attractive about them.

Well do I remember, in the village where I was born, an old lady who was passionately fond of gardens and flowers. She had a very large old-fashioned flower garden. Oh, the loveliness and sweetness of that old garden! Beauty everywhere. No nook or corner but what held hidden away some choice plant, flower or fern. Nearly always was the dear old woman to be found amongst her beloved flowers. I can see her now, although many years have gone by, with her big garden hat covering her sweet, shining face, tottering here and there, giving care to this flower or to that plant with a tender solicitude as if they were her children. If

visitors approached—for all were welcome in her garden, where there were no high fences to obstruct the view—she was willing, nay anxious, to share her treasures with them. The beauty of the flowers was reflected in her face. As she picked her bouquets and distributed them here and there, the generosity and prodigality of the plants and flowers caught response in her actions. The very personality of this dear old creature was a counterpart of the loveliness, sweetness and generosity of that old garden. Through my life, reaching from my boyhood, some of the closest personal friends I have had have been tree, plant and flower lovers. Not a superficial love, but what one likes to term what you gentlemen understand when I say a passionate love of the beautiful.

The woodland, the plant, the flowers, the rocks, have furnished the avenue down which have traveled some of the sweetest singers of all times. As we reflect upon the suggestion of the greatest of all teachers, when He said, "Consider the lilies," we are led to believe that He well knew the susceptibility of human nature to the softening and soothing influences of the beautiful in nature.

Wordsworth, singing in sublime notes the beauties of creation, and responsive to the influence of woodland, lake, flower, ferns, and the beauty sometimes trodden under foot by the thoughtless throng, these to him had language and meaning which caused him to burst forth in lofty response to the loveliness he saw.

Ruskin, with his eye, nay very soul, trained in all that was beautiful, whose character as one analyzes it seems to have fed upon the flowers scattered up and down his pathway,—his splendid spirit echoed the beauty as he saw it. He was one who could find in the coloring of a bird's wing material for splendid thought and conception. The things that he heard and the things that he saw found echo in the lofty ideals and inspiring words he has left as a legacy to mankind.

A few years ago it was my pleasure to look down upon the home of Tennyson in the Isle of Wight, an embowered home, a home fit for a poet and the home of a poet. I remember saying, "A man scarce could help writing poetry amidst such surroundings." As we reflect that this, one of the greatest poets of modern times, who with his keen analytical power seemed able to probe to the very core of human nature and one could almost say the Divine, we must come to the conclusion that his character was fed by the world in which he lived. His ability to reach over and forward across the brink, as it were, was enhanced by his response to the things which surrounded him.

These men may have been able and doubtless would have given voice to splendid ideals and noble thought amidst the blackened coal and mining districts of the Old World, yet the fact that they sought beauty, were enthralled by it, became its willing slave, doubly, nay, one can hardly say how much it intensified their individual capacity for sublime thought and expression. Thus we do well to lay great stress upon the necessity of educating and providing for the sustenance of that part

of our nature that finds its enjoyment in planting and in cultivating trees and flowers so as to adorn our home surroundings, which with a reflex influence give birth to and provide nourishment for some of the sweetest sentiments nature is capable of.

There is so much in the gradual evolution of country life. All we need is the trained eye, the discerning spirit and appreciative thought to provide the family with the forces that go for development of a high order and you will then be forced to admit the power of things present to influence things that are to come.

A little incident happened a day or two ago at my home that was fraught with much interest and deep meaning. To get the force of what I wish to say I must go back a few years. Nearly thirty years ago where I live, when first coming there it was wild prairie land. No trees, to attract the birds to nest with us, we planted trees, and, oh! the intense pleasure it gave us as one variety after another of birds came to be our companions and neighbors for the summer. Our boys as they became big enough were deeply interested in bird life. As summer succeeding summer brought us new visitors, their delight was great and when the golden oriole came it was an event in the history of our home not to be forgotten. Well, the years have come and gone, and many are the lessons trees, flowers and birds have taught us.

A few days ago my youngest boy found a crippled young oriole in one of the groves; he brought it to the house and placed it in a box by the window. The loving, anxious mother bird in some way or another found out where it was. She came close to the house and window, losing her usual timidity in her anxiety for the baby bird. So distressed was she that the boys took it out and left it on the lawn; fondly she came to it and in her caressing way enticed it amongst the taller grasses to give it protection. The lesson, ah well! loss of fear for self in the thought of another. The spirit of such an incident furnished a sermon that we would have been deprived of if environment had not provided the proper setting.

There is something real interesting in watching the development of thought and ideals in family life. These in great measure are illustrative of the ebb and flow of local community and national life. The awakening of the mental faculties, the gradual spinning of the garments that enwrap our sentimental personality, the perceptive and appreciative qualities that are so dependent for nutrition upon what immediately surrounds them, impels one to the conclusion that to get a robust and healthy character the proper food must be furnished to secure such a result.

This leads me to refer to something which I know all of you gentlemen are much interested in. It is of vital importance to us, as people, that we do all we can to further those things whose object is to develop in the youth of our state and nation an ability to rightly understand, not only the workings of the forces of nature, but of putting themselves in

harmony with the multitudinous beneficence that surrounds them, so that they in their personal characters shall reflect that which is beautiful and sweet. If during the formative period of our young people's lives their studies could be pursued amidst surroundings that reflect artistic and esthetic taste, schoolhouse, high school, college and university vying with each other in providing flowers, trees and shrubs in continuous profusion of foliage and bloom, we make bold to say the young life that is favored with such a framing will be very likely to respond in fruitage of the right kind. And if in addition to this their individual home surroundings partake of the nature of such a provision, to my mind there has been furnished that which will be almost sure, nay I will not qualify it but say of a certainty there will be an influence that must be of a refining and elevating character. The closer we draw the net, the deeper we probe, the more clearly are we led to the conclusion that that which we are in continual touch with leaves an imperishable impression upon individual character. Those of us who can look back and see our own life windings, most readily appreciate the truth of such a conclusion.

The demand that has arisen during the last decade, that we return to the country a disciplined mentality and a cultured and refined personality, is not of urban growth but reflects the sentiment of those who have been in touch with the vitalizing power that country life affords. True it is and I rejoice in the fact that so many of our masters and past-masters in commercial life are giving splendid aid and assurance of assistance. Our newspaper and men of literary pursuits, together with those in all kinds of professional life, are responding and offering to join hands in the laudable object of sending back to rural life and its pursuits, those of vigorous intellect and strong character who are carrying seed that, when deposited in so responsive a soil as is afforded by our splendid Nebraska prairies, will bear a harvest of immense benefit to our people. Yet I am led to reflect that it is only those who have drank long at the fountain of rural enjoyment who are able to put an approximately correct estimate upon the value of such a movement.

For many years in our country there seemed to exist the idea that life amidst rural pursuits had a tendency to dwarf and wither culture and refinement; still for some reason or another the material that was necessary to keep alive and aggressively vigorous the commercial and professional life of our populous centers, like the food which the congregated toilers require, has had to be provided by the country. Surely then the soil that can produce has the ability not merely of procreation but of maintaining and bringing to full fruition every element of personal charm of character, and if there is any place in the world that a man can step off with elastic tread into the great beyond it is from the home surrounded by all those beautiful things that nature has so abundantly provided and which the true Horticulturalist is ever in quest of. Oh yes I am compelled to believe and say that the Horticulturalist does not confine himself to merely material selection and cultivation, but his very love of natural

beauty impels him to a love of the beautiful in personal life and character.

There seems to be a close linking of characteristics between trees, plants and people, similar laws of growth and development appear to govern. The suppleness and pliability of the sapling and its response to early training, pictures largely the elements so marked in the first years of human life. The gaining of strength and growth with the reaching out of twig and limb reflects the developing processes ever going on in the expansion of our own personalities, and the maturing and gaining of more rigidity of character, with the ability to shelter and protect, is the counterpart of the disposition of the well grown and trained man or woman.

The same law of similarity seems to run through many phases of growth in the natural kingdom. It may be bordering on that which is of a metaphysical nature, but whatever may have been the processes by which men and plants have reached their present stage of development, there is a wonderful affinity existing between them, and as we submit this idea to a more acute analysis we discover they were made for each other and that our higher instincts whether innate or acquired find, in consorting with that which we commonly refer to as the natural world, a supreme gratification to a very apparent demand of the superior part of our being, and the finer the quality of our personal appreciation, whether of an aesthetic or scientific character, the deeper our personal pleasure.

There is another side of our subject that is interesting to note. Those of us who have for a lengthy period sojourned in Nebraska, cannot help having noticed the influence that Horticulture and tree planting in general has had upon not merely the personal life of our people but upon its development along a higher plane, if I may be permitted to so designate it, of their material life. Whilst receiving benefits of the higher order it is well for us to think for a moment or two of the immense material result that the planting, both of forest and fruit trees has had, and perhaps nowhere in our country is there better opportunity for aggressive work in the forestry than in this state. Notable leaders in the membership of this society for many years have preached both by example and precept the importance of Forestry and Arbor-culture and, as a direct result, blessings of untold value have followed. The trees they planted and those whom they inspired to become planters have both given rich result.

A few weeks ago it was my great pleasure to make a visit to Arbor Lodge. As one thinks of the log house that was the first habitation of the illustrious Morton, and of the scheme of beauty that was evolved from his striking personality, what a full tide it was that ebbed and flowed between him and his surroundings. As I stood in the shadow of the splendid memorial erected to his memory, nestling amongst the trees he had planted and whose companionship he had cherished, with uncovered

head, I thanked God that Nebraska had received, nurtured and matured a man of such sterling worth of character and inspiring example to all our people. The peculiar arrangement of the sentimental keyboard of our nature answers the chords that things pertaining of rural life set vibrating. The inner life is more responsive. The fierce suns in strictly commercial pursuits often parch and we are thirsty for the gentle rains and noiseless dews that opportunity for reflection gives. Lofty spirit and sublime thought are fed and refreshed by such a companionship.

I believe that men become more and more optimistic by consorting with trees, flowers and shrubs. Like the bird who frequents their abiding place, when he sings, he is apt to be looking upward, for the enrgizing power which is behind all naural life impels it skyward, so with mankind who seeks the companionship of the beautiful, there is an uplifting and soaring ability imparted which carries him above the clouds. As a rule the pessimist seeks the darkened cave and is willing to grope around in the shadows.

Before closing permit me to say a word or two in regard to a subject upon which so much attention has of late been paid in our country, that is, Forestry and the re-forestation of the territory that in so many ways has been the ruthless prey of the mere moneyseeker and those careless and thoughtless people who, with no concern apparently for their own or the weal of the future residents of the land, have destroyed that which has such a vital connection with the material condition both present and future of our country. The attention which thinking people are giving to this very important subject has been and unquestionably will be, fruitful of immense good. To have the occupant of the presidential chair together with many leaders in thought and action speaking and acting in no uncertain way, betokens better things for the nation. The criminality of the waste in regard to our timber lands has been most reprehensible. The destructive instead of the constructive principle has tarried too long with us and it behooves those who are alive to what a condition of affairs will inevitably lead to, that they join hands in stemming the tide of such ruthless waste and seek to be the leaders in an aggressive campaign which has for its object the retimebering of much land that has been depleted of trees, and the further extension of the forest area in the prairie states, especially in our own state. Such a mision will be fraught with wonderful opportunity for good. I shall not stop to specifically enumerate the different phases of this work or the peculiar adaptability of a large portion of our state for the furtherance of this scheme but content myself with the broad assertion that here in Nebraska we have placed in our hands by a wise Creator a territory that calls into service those whose eyes and thoughts are not merely hungering for more territory to devastate in their fearful greed for immediate pecuniary benefit, but who carry with them the trade mark and working tools of the true tree lover—those constructive and perceptive principles whose planting is not merely the gratification of self and whose vision perceives the untold benefits that pass as a legacy to those who are to follow.

The large area of Nebraska which seems peculiarly fitted for timber purposes, as proven by private and governmental experiments, and which for mere tillage purposes has an uncertain value, affords a splendid field for expansive work in forestry. The formulating and carrying into action plans for this specific work, will depend largely upon the men who are tree lovers, for like all great movements for the ultimate good, the ethical principle is the vitalizing power.

In this society and in kindred societies there have been those who for many years were apparently "Crying in the Wilderness" but preaching in no uncertain terms against the prodigal waste of our National resources, and especially against the greedy devastation of our forest area. The seed sown and the splendid work done by these pioneers in this particular line has and is bearing fruit, and when one reflects for a moment upon the personnel of the convention recently called by our esteemed president, we see that the thinking force of the nation is aroused and aggressive measures for an all round economy in the use of nature's gifts are being taken. Let us pause and ask the question, "Is this spirit of altruism born of the gross materiality of those who seek to get for themselves alone, and who live just for the present?" No, it is the fruitage of the motive that prompts the planting and conserving for future generations, and yet as we weigh immediate results, both in character and personal enjoyment, they who are governed by the latter spirit are infinitely enriched and those who succeed to the heritage they pass on are made wealthy thereby.

Before closing let me say that the task of the missionary of beauty is a delightful one, the essence of whose spirit is to provide enjoyment for others; the perfume arising from such service is free from selfishness and the inevitable sequence must be an elevating and refining power amongst our people.

One of my old friends who recently returned from attending the twentieth reunion of his class at Amherst College, in speaking of the culture and refinement of New England, and the beauty of its Horticulture and Arborculture, said, "It will take a long, long time to get anything approximately like it in Nebraska." Yes, perhaps it will, yet we believe in these fertile soils of this responsive prairie land there exists the ability to nurture and bring to full fruition that which perhaps seems to be a dream of the idealist, and I am optimist enough to believe that in the personality of the people who are scattered over these splendid lands are the elements which will respond to the beguiling influence of the beautiful in nature and art and as the years go on our own hearts will be gladdened in seeing the evidence of an ever increasing culture and refinement accompanied with a personal charm of character which is the crown of all human life.

The President: We will now be favored with a selection by the orchestra, as this closes our regular program for the evening. And if

there are no other questions or suggestions we will stand adjourned until 9:30 tomorrow morning.

After listening to two very enjoyable numbers by the Falls City orchestra, the meeting adjourned until July 22nd, 9:30 A. M.

WEDNESDAY, July 22,

9:30 A. M.

The President: First on our program this morning will be a paper by Mr. G. E. Merrell, of the United States Department of Agriculture, on the subject, "Spraying the Nebraska Apple Orchard."

Spraying the Nebraska Apple Orchard.

G. E. Merrell, U. S. Dept. of Agriculture.

The problem of spraying the apple orchard has probably received more attention from the experiment stations, and more discussion and speculation as to its merits by the farmers and fruit growers than any other single subject in the whole domain of Horticulture. A few words of the history of this important practice may not be amiss on this occasion. If we look backward a space of twenty-five or thirty years we find that the art of spraying is still in its infancy, and that it is developing along two different lines on the opposite sides of the Atlantic ocean. About this time, probably in 1878, the introduction of the downy mildew of the grape, an American disease, into the grape growing districts of south-western Europe, caused the native fruit growers there to experiment with various powders and liquid preparations for the purpose of preventing or curing this serious imported fungous disease. In the year 1882 the attacks of mildew were very severe and but few grapes ripened in the infested territory, except some along the highways. The maturity of this highway fruit was due to the following cause. It was the custom of some growers who had vines easily accessible to bad boys and other human marauders to coat these vines with verdigris, thus giving them the appearance of having been poisoned, to scare away the thieves. This year, in the interests of economy, a mixture of milk of lime and copper sulphate had been used instead of verdigris, and to the wonder of the proprietors, the vines, covered with this preparation, were the only ones maturing fruit. This account, is in brief, the history of the discovery of bordeaux mixture.

A few years previous to these events in France the spread of the Colorado potato beetle and the subsequent discovery in this country of efficacy of arsenical poisons in the control of this native pest, called the attention of some progressive farmers to the possibility of killing the canker worm by the same means. The oldest authentic record of the

spraying of apple orchards in this country is that of J. S. Woodward, of Guelph, New York, who reported to the Western New York Horticultural society in January, 1879, the results of a trial of Paris Green the previous season against the canker worm in the orchard of Mr. Haynes, of Niagara county, New York. Not only was the orchard rid of canker worms, but the ravages of the coddling moth within the fruit were greatly lessened. Thus we are indebted to the fruit growers of France for the discovery of the Bordeaux mixture, and to the wide-awake farmer of our own country for the use of poisons in a commercial way against destructive apple insects. The discovery of Bordeaux mixture and the use of the poisons against insects was made before the foundation of the experiment stations which, however, have been of inestimable value in perfecting formulas for the various solutions and in acquiring and disseminating information of all kinds relating to this and other important Horticultural subjects.

While the apple industry in Nebraska is confined to the eastern part of the state, and is of comparatively recent origin, it is by no means unimportant. The census of 1900 shows a total of 3,877,329 trees and a production of 1,343,497 bushels. Since this date these figures have undoubtedly greatly increased. Nebraska is fortunate in having but two or three ordinarily important insect enemies of the apple, and but one or two important apple diseases. One of these insects and one of these diseases, viz: the coddling moth and the apple scab may cause a total loss of the crop in some cases. Now it has been shown repeatedly in some sections of the country that these two pests may be profitably controlled by spraying. If then, it is possible to save a large proportion of this loss at a small cost, why should we not do so? To spray efficiently, it is necessary to spray understandingly, and to do this the fruit grower must know why he sprays and how and when to do it.

The question, "Why is it more necessary to spray now than formerly?" is often asked and may be answered in a general way like this:

1. The market demands a better fruit.
2. There are more kinds of insect pests than formerly; they are also more numerous.
3. Diseases are more prevalent than formerly.

Not only do we require better clothes, houses and live stock than did our fathers, but we also want better things to eat. The number of people who want and can pay for first-class fruit is growing larger each year. It then behooves the grower to produce only the best, for in this class of fruit is the greatest profit. It is impossible to produce this kind of fruit in most sections without spraying. Therefore, spraying to a wide-awake grower is as necessary as cultivation or pruning.

The second reason that spraying is more imperative than it formerly was is due to the fact that in their struggle for existence our native fruit insects have been assisted either by the increased cultivation of their host plants or by the destruction of their natural enemies. Foreign insects have also been introduced and distributed. As long as a country

is unmodified by human action insects are not likely to become extremely injurious because each species is held in check by some natural means. As soon, however, as an insect's environment is changed by the greater growth of its favorite food plant, the career of the potato beetle is illustrative of this point, or by the destruction of its natural enemies, it is liable to become seriously important in a short time. A comparatively harmless insect in one country, harmless because controlled by its natural enemies, may, on its introduction into another country cause untold damage, simply because it finds a more salubrious habitat, and is followed by few if any of its natural enemies. Examples of this class of insect pests are the gypsy moth, San Jose Scale, and many other destructive fruit insects. Unless the natural enemies of these insects are introduced with them or imported later we must fight them artificially by sprays or otherwise. As it is practically impossible to prevent the occasional introduction of an insect, these imported pests may be looked upon as one of the prices of our intercourse with other nations.

The greater prevalence of fungus and bacterial diseases in recent years may be accounted for by the fact that large areas in fruit growing districts are devoted to the growing of one kind of fruit and a disease once established in these regions has a large field for spread and development. The prevalence of peach yellows in some peach growing districts is an example of this. Certain of our improved varieties may be less hardy than formerly because the quality of disease resistance may have been sacrificed for other desirable points by the plant breeder.

To be specific we ordinarily spray the apple in Nebraska for two reasons: 1. To kill the codling moth. 2. To control the apple scab.

We will first consider the habits and life history of the apple worm or codling moth, which causes more damage to Nebraska apples each year than do all other insects combined. The codling moth is commonly the cause of worminess in the apple. Nearly every one has been surprised at the pinkish white worm at his work near the core, and many of you have wondered where the voracious invader came from and whither he went when his appetite was satisfied and his growth completed.

While we do not definitely know the original home of the codling moth, it is probably that of the apple. Although there are some restricted localities in which the apple is grown that are apparently not yet infested with the codling moth, it can be safely said that the moth is found practically wherever the apple is produced. The insect is distributed naturally by means of flight. As the moth is not naturally a strong flyer, the limit of distribution by this means is three or four miles in a single season. If then, an infested orchard is many miles removed from other orchards, as is often the case in the west, it is necessary to look for artificial means of distribution to explain the presence of the codling moth in that orchard. It is extremely probable that the insect was introduced into this country and since its introduction has been distributed mainly by the shipping of affected fruit from the infested regions to those previously uninfested. In this way the insect may be carried

thousands of miles in a single year. The spread is accomplished as follows: Fruit containing caterpillars of the codling moth is packed in barrels or boxes and in time, as the worms mature, they crawl from their early home to seek a sheltered place to spin their cocoons and pupate. Under the above-described circumstances they spin their cocoons in cracks, crevices and corners of the shipping cases. If these infested cases are located near an apple orchard when the moths emerge the establishment of a codling moth colony in that orchard is assured.

In Nebraska there are two broods of the codling moth per year, with possibly a partial third brood present some seasons. The eggs of the codling moth are, in shape, a flattened oval, and in size, that of a small pin head. When first laid, they present a pearly white appearance, but later on as the embryo develops they become yellowish in color. The first brood eggs are laid on the leaves about three weeks after the petals have fallen and hatch in five to ten days, depending on the weather. The young worm is at first white in color about one-sixteenth of an inch long and has a shiny black head. Its first meal is sometimes made from the tender leaves, but more often the healthy youngster begins at once his hearty meal on the apple itself, and seeks immediately the core and seeds, the most nutritious part of the apple. To begin his work he must find the calyx or some other depression on the surface of the apple. In all about 90% of the first generation enter the fruit at the calyx, the remaining 10% making their entrance from the stem or side of the apple. The ravenous feeder loses no time in his work, and at the end of three weeks has attained his growth and by that time has excavated an exit tunnel to the side of the fruit, although in some instances the full grown caterpillar leaves the fruit by its entrance route through the calyx or makes a tunnel to the stem end.

The depredations of its tenant generally cause the apple to fall, although it is by no means rare for the fruit to persist on the tree. The caterpillar, now full grown, crawls from its home, seeks a sheltered spot, and there spins its cocoon of white silk. The common location of the codling moth cocoons is under loose bark, in knot holes and in cavities and crevices in the tree. If the apple tree is young and smooth barked the caterpillar simply utilizes the most sheltered place available, which may be rubbish under the tree or lumber supported by it, in which take place those wonderful transformations by which the crawling caterpillar is changed to the winged moth. This process in the case of the codling moth takes about two weeks. The moths, within a few days of their emergence from the cocoon lay their eggs on the leaves and fruit. These eggs soon hatch and the young caterpillars mature as do those of the first brood. Unlike many of our common moths, the sexes of the codling moth are very similar in general appearance, a more than superficial

Unless they are very abundant, the moths are not usually noticed in the orchards, as they spend the larger part of their lives resting on the bark of the trees on which they are rendered inconspicuous by their color. The moth lives less than a week and is not attracted by light. The natural

enemies of the codling moth are many and various, but altogether they do not control the pest especially in those districts where there are two broods of the insect. The woodpecker is the most important of nature's enemies to the apple worm. So thorough in his work is this feathered ally of the fruit grower that it is often difficult in the spring to find living larvae of the codling moth except in those places that are absolutely inaccessible to Mr. Woodpecker. Beside the woodpecker and other birds there are many predaceous and parasitic invertebrate enemies of the codling moth but as a whole their work in subduing the pest is of comparatively little importance.

Man's remedies for the codling moth may be either preventive or remedial, and of the many suggested for the pest's control, spraying is by far the most efficient and practical. Spraying while perhaps profitable in the neglected orchard, should never be expected to take the place of cultivation, pruning, and other work necessary for success in the fruit growing business. Clean culture, scientific pruning, removing loose bark, destroying windfalls all have their influence in the control of the codling moth. If bushes and weeds are not allowed to mature in the orchard, if the trees are kept smooth and well groomed, if rubbish and brush are removed suitable hiding places for cocoon spinning and desirable winter homes for the enclosed larvae are correspondingly fewer, and the insect is compelled to pass the winter exposed to the attacks of its arch enemies the various woodpeckers. By properly pruning the orchard from its start decayed stubs and hollow knots may be obviated.

Spraying the trees at various times with an arsenical poison is the most effective means man has yet devised for the control of the codling moth. As the pest passes the destructive portion of its career wholly within the apple, it would seem at first a difficult proposition to poison the insect, but nature has not perfectly defended the insect from the attacks of man, and by utilizing our knowledge of its life cycle we can make its career a brief one. We know the 90% of the first brood of the codling moth caterpillars enter the apple through calyx and if we can coat the calyx cavity with poison the chances are that the young worm's first meal will be his last. Spraying the apple as soon as the petals have fallen and before the calyx lobes have closed is the only effective way of doing this. Now this stage in the development of the apple lasts but a week, the orchadist must then lose no time, especially if his orchard is extensive. For the benefit of the remaining 10% of the young worms that enter the apple from the stem end or side and for the few that may taste the tender leaves before entering the apple, this poisonous spray is generally repeated about three weeks after the petals have fallen, and before the codling moth eggs have hatched. In spite of all of its natural enemies man's preventive measures, his remedies against it enough of the first brood of the codling moth generally mature to make the second brood, where prevalent as in Nebraska, much more numerous than the first. This second brood can be controlled by means of poison from the first spray still in the calyx cavity and by

two supplementary arsenical sprays made about nine and eleven weeks after the petals have fallen and before the second lot of eggs hatch.

In some parts of this country in some years, notably in parts of Michigan and New York, in 1892 and 1893 the destruction of fruit by the apple scab was complete, and the foliage was so injured that the orchard presented a fire-swept appearance and the following years was seriously injured. Some varieties of the apple are much more susceptible to the attacks of scabs than others, and the scab is much more prevalent some years than others. Cold wet weather is necessary for good development of the scab fungus, the spores of which come in the spring from the dead leaves of the previous season. The fungus attacks the leaves and fruit early in the season and in treating susceptible varieties and application of Bordeaux mixture should be made as soon as the cluster buds begin to separate. Subsequent application of the fungicide at intervals of two or three weeks will effectively control the scab even when the conditions are unusually favorable for its development. The scab, while not so uniformly present in Nebraska as is the codling moth, is responsible in many years for immense losses to the apple grower.

The Bordeaux mixture our best fungicide and the remedy commonly used to control the apple scab is a preparation made by mixing lime water and a solution of blue stone. The amounts of lime and blue stone used vary from five pounds each to fifty gallons of water. The fungicidal properties of the Bordeaux mixture are due solely to the blue stone, the lime being used to prevent injury to the fruit and foliage from the blue stone, and to give adhesive qualities to the mixture. When the Bordeaux mixture is to be made in any considerable quantity it is desirable to have stock solutions which can be made as follows:

Start the day before you plan to spray, hang fifty pounds of blue stone in a sack or basket near the top of a fifty gallon barrel full of water. By the following morning this blue stone will be dissolved and you will have a blue stone stock solution containing one pound of blue stone to each gallon of the solution. Now slack fifty pounds of good stone lime in another fifty gallon barrel, stirring the lime constantly and using just water enough to keep the lime from burning. As soon as the lime has slacked fill the barrel with water. You will now have a stock solution of lime of the same strength as the blue stone stock solution. Bordeaux mixture is made by diluting the required amount of each stock solution to half the capacity of the spray tank and then turning these diluted solutions together into the tank. If the Bordeaux mixture has been properly made of good material it should have a deep sky blue color.

The question of poisons is one of importance and both arsenate of lead and Paris Green have their advocates. Paris Green is the cheaper, has fungicidal properties, but is apt to burn the foliage and requires much agitation of the mixture to keep the poison in suspension. Arsenate of Lead is possibly a more effective insecticide, sticks to the foliage better, remains in suspension longer but is considerably more expensive than

is Paris Green. Perhaps the ideal way of solving the insecticide question is to use Paris Green as long as Bordeaux mixture is used and apply the arsenate of lead for the second brood of the codling moth. When Paris Green is used six ounces of the poison to fifty gallons of water is sufficient, while two pounds of arsenate of lead are required for fifty gallons of water.

The problem of a mixing station is one that must be solved by each grower. In general, an elevated platform is a profitable convenience, especially is it so if the water supply is already elevated. A good water supply is a necessity if there is much work to do, and as spraying should be done every year, a permanent station is desirable from the start.

The treatment of the apple scab and codling moth can usually be carried out together and the ensuing schedule which is being used this year in demonstration work by the Department of Agriculture and by the experiment station at Lincoln is recommended for Southeastern Nebraska. The dates given are approximate and of course vary with the location and season.

First application:—As the cluster buds open (about April 25th). Use Bordeaux mixture, 3-3-50 plus 2 pounds of lead, or 6 ounces Paris Green. Bordeaux mixture may be omitted on non-scabing varieties in favorable seasons.

Second application: At once after petals fall (about May 10). Dilute Bordeaux mixture and poison spray, viz., 3-3-50, plus 2 pounds arsenate of lead, or 6 ounces Paris Green. The application at this time should be made with a nozzle cap with large opening, the nozzle at an angle to the spray rod, spraying from above as much as possible and directing the spray downward into the apple clusters. This treatment should be excessive, using about twice the usual amount.

Third Application: Three or four weeks after the petals fall (about May 30). Use Bordeaux mixture and poison spray as in first application.

Fourth Application: Nine or ten weeks after petals fall (about July 12-15). Use 2 pounds Arsenate of Lead to each 50 gallons of water, adding milk of lime made from slacking 2 or 3 pounds good stone lime. Bordeaux mixture at this and subsequent applications is to be omitted.

Fifth Application: Two or three weeks after fourth treatment (about August 1st). Use arsenate of lead 2 pounds to 50 gallons of water with lime, omitting Bordeaux mixture, as for the 4th.

To spray efficiently it is necessary to be well equipped with modern apparatus. The kind of machine used will depend largely on the size of the orchard. In spraying as in other farm operations, it is economy to purchase first-class apparatus of sufficient capacity for the purpose intended. Whatever kind of pump is used it should have brass wearing parts, as the Bordeaux mixture will quickly corrode iron or steel. The pump should be of the simplest construction possible and with working

parts easily accessible. If a hand sprayer is to be used select one supplied with a good agitator easily removed from a tank or barrel with as little exposed above the barrel as possible.

There are many gasoline power sprayers on the market and while none of them are perfect and each grower must be governed by his own conditions in selecting one, they are necessities in orchards of any considerable size. Man's power is too costly to be used in working the pump handle. In hilly orchards the weight of the outfit is of more than ordinary importance.

While the traction power sprayers may be useful with small trees it is not usually an economical investment. Whatever kind of pump is used the accessories should be of the best quality. Bamboo rods and nozzles of Vermorel type are the most efficient. The hose should be the best obtainable and the leads used should be of good length, from 25 to 35 feet, as both sides of two rows can then be sprayed at once, and more effectively than when half a tree is sprayed at a time as would be the case with shorter leads. Transportation of the machine, which is an item to be considered, with a heavy power outfit is thus lessened. If the trees are more than fifteen years old an elevated platform on the wagon or tank will probably be necessary in order to thoroughly spray the tops of the trees.

Cost of spraying varies very much with the conditions and depends on the kind of sprayer, cost of material and labor, and the size of the trees. It has cost this year in one of the demonstration orchards in which the trees are 12 years old about 14 cents per tree for three applications of the Bordeaux mixture and the arsenate of lead. In figuring these results labor is reckoned at 15 cents an hour and the team at \$2.50 per day. To this expense already incurred must be added the cost of two more applications of the arsenate of lead, or say $3\frac{1}{2}$ cents per tree, making a total cost of about 20 cents per tree for the season, if we allow liberally for the cost of hose and wear and tear on the outfit. Where the Wine Sap apples in this orchard have been left unsprayed the crop will be of absolutely no value. Where they are sprayed three bushels of first-class apples to the tree is a small estimate of the crop. The moral is obvious. What other operation in the apple orchard pays better?

Mr. Keyser: In regard to these spraying demonstrations,—I wish this society would push this kind of work and do everything possible to forward the interest in it. I have had a little experience in this work, and also in the Farmers' Institutes, and I found that it was hard to get the people sufficiently interested. We told of our experiences and gave all sorts of directions and all the information we could, but I don't suppose there were half a dozen people in all the places where we lectured who tried to spray according to directions. This work that the Government is doing is very good, but unless we get the people interested and tell them what we can do it is not doing near the good that is intended. If we can show the people the practical side of this question of spraying,—what

it amounts to and what it will bring in dollars and cents, that is the best argument that we can advance. And I would like to see our society take hold of this and help show the people what can be done along these lines.

Mr. Merrell: That certainly is a very worthy idea and one that I would like to have impressed more; and this is certainly a good year to show the people what can be done by spraying.

The President: Next on our regular program is the subject, "The United States Department of Agriculture and its Work," by Honorable E. M. Pollard, of Nehawka.

The United States Department of Agriculture and its Work.

E. M. Pollard, Nehawka.

Mr. Chairman, Members of the Society, Ladies and Gentlemen: I am very glad to be here with you today. I am afraid, however, that my subject is entirely too big to do it justice in the short time that I have at my command.

The United States Department of Agriculture is a large organization and covers a very wide scope of work. Its work has to do with almost every phase of farm life, and if I were to undertake to describe the work of the whole Department including all its bureaus I am afraid I would have to stay here until six o'clock tonight, and I am sure you don't want to be imposed upon to that extent. I will take up only two of the great bureaus of the Department and refer in the very best way I can to the work that is being done by them,—some of the work that is being done by the government at Washington to aid the farmer.

The first bureau that I want to speak of is the Bureau of Animal Industry, which was established in the year 1878. The first appropriation, \$10,000, that was ever allowed for this kind of work was made that year, and the work begun. The first work was a study of animal diseases, where they took up the study of such diseases as black leg, pleuro-pneumonia, etc., which had been working such havoc among the live stock growers of the country. And this study and work has been progressing from that day to this. The Department has practically eliminated the black-leg among cattle, which in the earlier years was supposed to be responsible for about fifty per cent of the loss in cattle, until now among the live stock growers of the country the loss is less than ten per cent. Pleuro-pneumonia too has also been stamped out by the work of the Department and many other diseases have been entirely exterminated. This work of the Department of Agriculture is not confined to the diseases of cattle either, nor to any particular section of the country, but is carried on in connection with the growing of all live stock and in all parts of the United States. Each particular disease is studied in connection with its locality and surrounding conditions and in every instance the Department undertakes to find a remedy,—to improve con-

ditions, eliminate the cause, and thus secure the best results possible. Here in the west we are interested in the growing of cattle and sheep and hogs, and the live stock growers of this section of the country are co-operating with the United States Government in order to get the best results possible.

The entire work of the Bureau of Animal Industry which is carried on in the South is a warfare against what is known as the Texas Fever. This Texas Fever is a little insect or mite that attacks the animal and just simply kills the animal directly. The animal comes down with a very high fever and it is only a short time until it is dead. This is one of the greatest drawbacks or hindrances to the development of Agriculture and Animal Husbandry in the South. The very finest Shorthorns, Herefords, Galloways, and in fact all of the finest breeds of cattle in the south are subject to this so-called Texas Fever. It is preventing the building up and development of the South. The Government is contending with this question and they have now found a remedy for this Texas Fever. Last year the Department of Agriculture appropriation for fighting this disease was \$150,000 and this year it is \$2,000,000. The United States Department has established down there what is known as the "Dead Line," running clear from the Atlantic to the Pacific, the border line where Texas Fever begins. They are gradually getting control of this disease and are forcing this dead line south as fast as possible. This is one of the greatest and most important undertakings that the Government is carrying on at the present time.

Another important question that the Government is engaged in trying to work out is that of hog cholera. The study of this disease was begun in 1878 at the time the first appropriation was allowed, and from that time until this the work has been carried on by the Government and the different Experiment stations of the various states all over the country. Congress has been more liberal in these things than our state legislatures and for that reason they have been doing a lot more practical work. This has now reached the point where they have found a remedy for this disease. When Dr. Melvin announced that they had found a cure for hog cholera I knew it must be so. Dr. Melvin is not a radical or assertive man at all, but one of the most conservative men I have ever known, and therefore it seems that there is no question but what they have discovered a remedy for this disease. Now I don't want to give out the impression that they can go into a herd of hogs that have the cholera and save every one of them, but I do say that they can take a herd where the cholera is just breaking out and save from 85 to 95 per cent of those hogs. And if they can do that it is worth millions of dollars to the farmers of this country. When I took up with this work here in Nebraska I was criticised by some for taking up with a matter that did not have any merit in it, but now that success is assured in combating this long dreaded disease I think the people should know about it. I gave out a statement to the effect that the Department would have a representative call at any place where he was wanted. To be sure this is a pretty big affair, but the

Department always has men ready to be sent out on short notice. To show the success of the plan,—Mr. Grinstead, up at Salem, had some hogs affected with cholera. A man went to look at them and saw at once that they were too far gone to be saved. Mr. Grinstead went to one of his neighbors and bought eight shoats, where there was no cholera. He took them to his home, and had four of them inoculated and the other four were not inoculated. He put them all into the pens where the hogs had been dying and in with the sick hogs that were sleeping there in the pens. The four hogs that were inoculated are still living, while the four that were not inoculated all died. Now this is merely one instance of the success of the plan. The same results are accomplished in many other places. I mention these matters simply to show you what the Department at Washington is doing for the people of the United States.

I might go ahead and speak of the matter of inspection of meats. This matter was first taken up in 1890, and the first law that was passed upon this subject related simply to cured meats. In 1891 laws were made to apply to all kinds of meats, and in 1906 the Meat Inspection Act was passed. That bill provides for inspection of all meat that goes into interstate or foreign commerce. That law is so worded that in effect the Government inspects all the meat that is consumed by our people, whether interstate or whether confined to state commerce. As a matter of fact the effect is that there is a very rigid inspection of all meats that are used in the entire United States. Congress is appropriating annually for this matter of meat inspection \$3,000,000. The best meat that is consumed and which is known to be the best bears the Government stamp, and every piece of this meat that is inspected bears this stamp, which is the Government's guarantee that that piece of meat is pure and wholesome and absolutely free from disease of any kind. All the meat that is used for family use in the cities and towns, whether you get it from Omaha, Kansas City or Saint Joe, you will notice bears the Government stamp of inspection and this signifies that it is all right.

I think now that I have said enough, or at least as much as I am warranted in saying with the limited amount of time that I have, on this subject of the Bureau of Animal Industry, and the other bureau that I want to discuss is the Bureau of Plant Industry. This is another of the many bureaus of the United States Department of Agriculture. The work of the Bureau of Plant Industry has to do with all the features of plant life. It includes the division of soils and all other divisions and bureaus whose work relates to plant life. This Bureau of Plant Industry was established as a separate bureau in the year 1900, and the work of this bureau has been of inestimable value to the farmers of this country.

In the first place, the Department of Agriculture was organized during the War of the Rebellion, in 1862. It has grown from year to year until now the estimated value to the country of the work of this department is over \$60,000,000. In 1867 the United States Department of Agriculture brought from France some sugar beet seeds,—I think some eight

or nine different varieties. The first were planted in Illinois and Michigan. The first beet-sugar factory in this country was built in the year 1869. And this industry of raising beets for sugar has constantly grown and developed from then until now,—that is this last year, the product of sugar beets was in value something over \$20,000,000. The Department has not only been encouraging the growing of sugar beets but has been conducting experiments of cross fertilization, cultivation, etc., to increase the sugar output of the beets until today the portion of sugar in the beets is as high as twenty per cent. And I don't believe the day is far distant when the United States of America will produce every pound of sugar that we consume.

In 1890 Honorable James Wilson, of Iowa, became Secretary of Agriculture, and under his administration of the Department the farmers of the country have been benefited more and the country as a whole has been benefited more from then until now than had been accomplished in all the time prior to 1890. The reason for this is obvious. Mr. Wilson is a practical farmer; he operated a farm at home in Iowa, and most successfully too. And when he entered that Department he took with him the knowledge and value of actual experience. No sooner had he taken hold of that great Department than he began to look around to see what he could do to help the farmers of the country. While Secretary Wilson came from Iowa, he was nevertheless familiar with the other regions of the United States, and one of the first things that he did was to go to the plant pathologists and other scientists and get from them their ideas as to what they thought was good. He wanted to get something that would be well adapted to the semi-arid regions of Kansas, Nebraska, Oklahoma and the Dakotas, and his efforts along this line have resulted in the growth of alfalfa to the great extent that it is now grown and also in showing that we can grow a good winter wheat in this section of the country. Our wheat crop is now almost entirely of the winter variety. One of the best things that has come about under Mr. Wilson's administration is the great strides made in the growth of alfalfa in this country. Alfalfa has been one of the best things ever brought out for the great northwest,—Minnesota and the Dakotas, where a hardy variety is planted.

Another of the valuable and important lines of work carried on by this Department is the investigations in the Bureau of Soils. Here in the so-called great northwest the people think their soil will always be good and so far as they can see it looks as though it is just as rich and fertile as ever. Mr. Wilson knows this is not so and has undertaken to show to the people why their soil will not always be just as rich as it is now. The experts sent out by the Department of Agriculture to study the question of soils have finally reached this conclusion: That the soil does not become worn out,—that the soil here in Richardson County is still just as rich and fertile as when it was broken up; that the cause of the decline in crop production on soil that has been producing wheat for fifty years is due to the fact that the soils do not give off their poisons. Take a certain piece of land and plant the same crop there year after year and the

land will become so thoroughly saturated with the poisonous matters from this one plant that it will interfere with the production of that crop very materially. To remedy these evils the Department of Agriculture is co-operating with the State Experiment Stations all over the country,—the station at Washington being the center of all this work. And through the work of these state experiment stations and the Department work at Washington the same conclusion has been reached,—that the proper rotation of crops is the best way to allow the soil to throw off these poisonous matters. They recommend the planting of alfalfa and clover on ground affected by continuous planting of one crop until all these poisons are destroyed because of a lack of proper food and nourishment, and then you can begin all over again and raise just as good corn as before.

This is simply a great big question of education. I wish I could take you all down to Washington and show you through the different Departments down there and shown you what they are all doing for the American people. One of the first things that impressed me was the great fund of information, and this information is absolutely free to the people of the country simply for the asking. For every line of investigation that is being carried out they publish bulletins, pamphlets, books, etc., but many of these are in such technical language that the average farmer would not understand them. When I became a member of the Agricultural Committee one of the things that impressed me most was that more provision should be made for getting all this information to the people. The people of the country should have the benefit of it. The Government is carrying on investigations in other lines of work, and in all of these there is abundant information for the farmer, but he does not get all the benefit from it that he should. If the farmer of the country knew of the results that could be accomplished by the recommendations of the Government they could increase the yield of their corn from twenty to fifty per cent, they could increase the yield of their wheat from ten to forty per cent every year.

And I want to say in conclusion, that I hope the people of Richardson County, whenever they get the opportunity, will help the farmers of this country by getting for them the advice and counsel of the men from this great Department of Agriculture, and help them to increase their farm production, to get more out of it, and help to make easier their declining days of life. I thank you. (Applause.)

Mr. Swan: Mr. President, I move that Miss Edna Crooks be made an Annual Honorary member of this society. Motion carried unanimously.

The President: We will now have the report of Committee on Final Resolutions.

RESOLUTIONS.

Your committee on resolutions wish to express the appreciation of the Nebraska State Horticultural Society to the citizens of Falls City

for the hospitality shown, for the splendid musical entertainment furnished, and for the delightful automobile trip to the country around Falls City.

ERNEST M. POLLARD,
G. S. CHRISTY,
W. G. SWAN,
Committee.

Meeting adjourned.

MISCELLANEOUS REPORTS.

REPORT OF THE ENTOMOLOGIST.

The accompanying report on the insects that were more especially injurious to horticultural and forestry interests in Nebraska during the past year has been prepared by Professor Myron H. Swenk, my assistant.

In addition to the report I am including as an appendix the greater portion of an important special bulletin on the "House Fly," recently published by the fly-fighting committee of the American Civic Association of Washington, D. C. This bulletin will explain itself.

LAWRENCE BRUNER, State Entomologist.

THE PRINCIPAL INSECTS INJURIOUS TO HORTICULTURE DURING 1908-09.

By Myron H. Swenk, Assistant State Entomologist.

Two years ago the writer presented to the Nebraska State Horticultural Society a report on the injurious insects of the biennium 1906-07, viewed from the standpoint of the horticulturist, and this paper was published as Bulletin 19 of the Society and later reprinted in the Annual report of the Society for 1908, pages 141-158. In the present paper the intention is to deal similarly with the insect pests of fruits, shade trees and ornamentals which have come to the notice of the Entomologist and his assistant during the two years extending from April 1, 1908, to April 1, 1910. Only the species not considered in detail in the former report will be amplified upon in this one, since the reader can secure information upon those pests previously discussed by simply referring back to the preceding volumes, thus avoiding useless repetition.

General Summary of Insect Injuries.

The codling moth (*Carpocapsa pomonella*), which was quite fully discussed in the last report, continued to be a great pest in the apple orchards during the two seasons here under discussion. In some orchards where the crop was an almost complete failure in 1907-08, the 1909 crop was said to be somewhat less severely injured than normally, this being possibly due to a partial starving out of the pest in limited areas. On the whole, however, the 1909 crop was about as severely attacked as ever in orchards where scientific spraying was not practiced. Some small unsprayed orchards which came under the observation of the writer contained scarcely a perfectly sound apple in the entire orchard, owing to the attack of the apple worms and scab.

The plum cruceo (*Conotrachelus nenuphar*) forms a close second

to the codling moth in Nebraska in point of injury to apples, and are more injurious to peaches and plums than any other pest attacking these fruits in this state. Several cases of serious injury to peaches, especially in eastern Nebraska, and to plums throughout the state by curculio attack have been reported to this office. The larva of this curculio we have found badly affecting cherries in several instances, one orchard near Florence being greatly damaged each year by this insect, and an undetermined larva, probably of this species, was reported as injuring apricots near Lincoln. During 1909 the wild plums in several localities in northern and western Nebraska were injured by the plum gouger (*Coccotorus prunicida*), but there were no reports of very serious damage by this insect. The Entomologist also found the beetle *Anthonomus helvolus* with its beak embedded in young apple fruit at Lincoln, June 15, 1908, exactly in the manner of its relative, the apple curculio; we believe this is the first record of this snout beetle attacking the fruit of the apple.

The leaf crumpler (*Mineoca indiginella*), the life-history of which was fully given in the previous report, continued its characteristic injuries through both the seasons of 1908 and 1909. The same areas which were noted as particularly infested in the former report have continued to provide the majority of complaints of this insect during the biennium herein covered. In the vicinity of Hartington and Tilden in Cedar and Madison counties, about Broken Bow and Mason City in Custer county, Eustis in Frontier county and Miller in Buffalo county, this insect has continued very commonly, and additional regions of infestation have appeared about Trenton in Hitchcock county and Anoka in Holt county. In all these cases while the apple is most frequently attacked, cherries and plums are also frequently infested, and the injuries are often of a serious nature, especially on young trees. Either this insect may be occasionally double brooded or else the single brood in extended over an unusually long period since material collected in northern Nebraska August 11, 1909, while showing a great majority of empty pupal skins also had living pupae, the moths of which emerged toward the middle of the month. These pupae also proved to be rather heavily parasitized, the pupa containing from two to four of the parasites which were in the pupal stage when the material was collected August 11, but which commenced issuing as adults the following day. The accompanying plate (Plate 1) illustrates the nest, pupa, moth and parasite of this species.



PLATE 1. The Leaf Crumpler (*Mimola indiginella*); *a*, winter nest on larvae on apple; *b*, pupa in opened nest; *c*, parasite of the leaf crumpler; *d*, moth. (Original).



PLATE 2. The Apple Dagger-moth (*Apatela* sp. *a*, full grown larva; *b*, cocoon; *c*, pupa *d*, moth; *e*, work of larvae on apple leaves. (Original.)



PLATE 3. *a*, Parasite and parasitized larva of the Apple Dagger-Moth; *b*, apple twigs showing injury by *Typophorus canellus*.

In Hitchcock county in the vicinity of Trenton, several orchards were severely infested with a new apple pest in the form of a caterpillar of a dagger moth belonging to the genus *Apatela*. This injury, which was quite severe, occurred during the earlier part of August, 1909. In company with the dagger moth caterpillar, which was responsible for most of the defoliation, there also occurred numerous individuals of the unicorn prominent (*Schizura unicornis*) which undoubtedly materially assisted the injury. Of the eleven of the *Apatela* larvae sent in by Mr. J. W. Frey of Trenton, Nebraska, August 20, 1909, two were preserved as specimens and the other nine placed in breeding eggs and of these nine six subsequently died from parasitic infestation. The three unparasitized larvae continued development, two pupating August 26, and the third August 30, and these giving forth two moths January 26, 1910, and a third moth the latter part of February. From the parasitized larvae two parasites emerged March 13, one March 14, two in middle April and one April 20. Of six caterpillars received from Mr. A. Dillman of Trenton, August 11, 1909, four died of parasitic infestation. This would seem to indicate that this insect is being taken care of quite satisfactorily by its parasite and is unlikely to again prove injurious during 1910. The caterpillar, its cocoon, pupa and moth and its work on the apple foliage are shown in the accompanying plate (Plate 2); also its parasite and a parasitized larva (Plate 3, figure a).

In some of the orchards near Lincoln during the middle of July 1909 the apple trees were rather severely attacked by the apple-leaf skeletonizer (*Canarsia hammondi*), defoliations by this pest in some cases involving most of the large branches of the trees, nearly every leaf being attacked by a larva. By early August most of these had transformed into pupae and the moths began emerging on the eleventh of that month. No evidence of parasitism was encountered in our breeding cage work with this insect, and it is not unlikely it may prove injurious again during the coming season as during 1909. Some idea of the character of the work of this insect may be gained by examining the plate illustrating an attacked branch and leaf and the pupa and moth of the insect itself (Plate 4.)

The year 1908 was attended by serious defoliation of cultivated cherry and plum and also wild plum by the apple-tree tent-caterpillar (*Malacosoma americana*) in several sections of the state, notably in Madison and Frontier counties. The injury began in latter April and continued through May. As this insect was fully discussed in last year's report it will not be discussed further here. A species of leaf-beetle, *Typophorus canellus*, was found abundantly in an apple orchard at West Point in early May 1908, where it injured the trees by eating holes in the leaves, especially those of the lower branches. This insect, although known to attack the raspberry and crab apple commonly, has not to my knowledge been before recorded as being present in apple orchards by the thousand and injuring the foliage of the trees as was true in this case. An injured twig is here illustrated (Plate 3, fig. b).

The buffalo tree hoper (*Ceresa bubalus*), which was fully treated in the preceding report, continued its injury in apple orchards throughout the state during both seasons. The stings of this insect are sometimes mistaken by the misinformed for scale insects, although the resemblance is very slight indeed. Up to the present time there have been no authentic cases of the occurrence of the San Jose scale (*Aspidiotus perniciosus*) within the borders of Nebraska, although during 1908 there were reports that this insect was present in certain orchards in southeastern Nebraska. Investigation by the Entomologist and his assistant invariably showed such reports to be groundless. The oyster-shell bark louse (*Lepidosaphes ulmi*), however, seems increasing in abundance in many portions of the state, and repeated instances of real injury to the infested trees have come under our observation during the past two years. This sometimes extends to the infestation of the fruit itself as is shown on Plate 5. Cases of injury have been reported from Cuming, Colfax, Douglas, Cass, Saunders, Lancaster, York and Hamilton counties. This scale was treated very fully in last year's report. It may be added that a number of instances of the value of the ladybird beetle *Chilocorus bivulverus* as a natural enemy of this scale have come to our attention during the past two years also. This valuable beetle is illustrated on Plate 6.

The cherry aphid (*Myzus cerasi*) which was so abundant during 1907, continued in great abundance during 1908, but almost entirely disappeared during 1909. In 1908 it attacked principally the plum trees and to a lesser extent the cherry, killing the leaves of these fruit trees very extensively and in some cases causing the trees themselves to die. The injury was general over the state but more conspicuous in central and western Nebraska, from Nuckolls, Webster, Kearney and Howard counties west to Frontier and Hitchcock counties. There were also reports from Richardson, Otoe, Antelope and Madison counties. The peach aphid (*Myzus persicae*) was reported as injuring trees in Gage county in 1908, but was apparently not injurious at all in 1909. Both these fruit tree aphids are discussed in the State Board of Agriculture report for 1908, pages 320-321.

One of the most important horticultural pests of the state is the peach-tree borer (*Sammia exitosa*) which seems of recent years to be gaining in abundance and destructiveness in southeastern Nebraska. Instances of serious injury from Richardson, Lancaster, Douglas and Platte counties have come to our notice, some trees being found which harbored over thirty of the larvae of this insect and many in a dead or dying condition. This pest will be found discussed in detail in the following pages. Another insect of prime interest to Nebraska horticulturalists which was not discussed last year and which is treated further on in this paper is the fruit-tree bark-beetle (*Scolytus rugulosus*), which has shown itself to be a serious pest of all our fruit trees, but conspicuously of the cherry. The apple-tree borer (*Chrysobothris femorata*) was also locally injurious in various parts of the state.



PLATE 4. The Apple Leaf Skeletonizer (*Canarsia hammondi*): *a*, branch of apple attacked by skeletonizer; *b*, leaf of apple skeletonized by this insect; *c*, pupa; *d*, moth. (Original).



PLATE 5. The Oyster-shell Bark-Louse (*Lepidosaphes ulmi*): scales on young apples. (Original).





PLATE 6. The Twice-stabbed Ladybird (*Chilocorus bixulnesus*): beetles and pupae on bark of cherry tree. (Original).

Four species of slugs or saw-fly larvae were conspicuous during the biennium here under discussion. The rose slug (*Monostegia rosae*), was very generally destructive during 1909, in middle and latter June, when it was reported defoliating roses very extensively all over the city of Lincoln and also in Omaha, Seward and other towns in southeastern Nebraska. The native currant saw-fly (*Pristiphora grossulariae*), was found injuring gooseberry bushes in Richardson county during latter July, 1908 to such an extent that most of the leaves on many of the bushes were stripped to the veins. In latter May 1909 both the currant and gooseberry in Saunders and Washington counties in the vicinity of Wahoo and Arlington were extensively skeletonized by the currant worm (*Nematus ribesii*), which is here illustrated on Plate 7. Another species of *Nematus*, *N. ventralis*, was found by the Entomologist very seriously injuring the leaves of Carolina poplar in Douglas county near Florence, and as this slug is said to be several brooded annually, it may become a very serious pest if it decides to attack the Carolina poplar regularly. The treatment for all these slugs is practically identical with that recommended for the pear slug in last year's report.

A comparatively new pest in this state, but one which during the last two years has caused a great deal of damage to the grape crop in some parts of eastern Nebraska is the grape-berry moth (*Eudemis botrana*). This pest caused a total loss of crop in several orchards in the vicinity of Lincoln during 1909. It will be found fully discussed on a following page. Reports of an unidentified larva seriously defoliating grapes in Webster and Pawnee counties were received during July and August of 1909, but owing to the press of other work were not investigated as fully as their importance merited. There were also reports of cankerworm on grape from Chase county in June 1908.

One of the most important enemies of the small fruits during the years of 1908 and 1909 was the strawberry leaf-roller (*Ancyliis comptana*) which during both seasons very severely damaged many strawberry beds in eastern Nebraska. There was instances of damage, however, as far west as Cherry county. This insect was quite fully treated in Circular No. 7 of the office of State Entomologist, and as that circular is still available it will not be discussed in detail here. The life-history of this pest was quite thoroughly investigated in 1908.

There was quite a decided diminution of injury by the rose chafer (*Marcrodactylus subspinosus*) in the two years covered by this report as compared with the two preceding years; yet this insect was by no means absent or harmless during the biennium here considered, especially during 1908, when it was reported as injuring roses, grapes, plums, cherries, strawberries, currants and the foliage of various vegetables, shade trees and flowers in practically all of the region included by the counties of Rock, Cherry, Logan, Lincoln, Kearney, and Hall. The rose chafer is discussed in Circular No. 3 of the office of State Entomologist, which may be had for the asking.

The stalk borer (*Papaipema nitela*) was somewhat injurious in some

parts of southern Nebraska to gooseberry and currant bushes by burrowing in the stem. A species of twig mite, working in gooseberry, came to our notice from Box Butte county. The snowy tree cricket (*Oecanthus niveus*) was found to have extensively injured the raspberries, blackberries and grapes in several fruit farms in the vicinity of Florence in 1908. Many of the canes of blackberry and raspberry were dead and filled with the tree cricket eggs for nearly their entire length, some stems actually containing hundreds of these eggs. One fruit grower estimated his loss because of this insect at over \$300.00 during the preceding year. During middle May of 1908 the mulberry trees in certain localities near Lincoln were more or less injured by the work of the larva of a Cerambycid beetle (*Dorcaschema alternatum*) which in some trees was so abundant as to cause their death. More will be said of this borer on a succeeding page.

Among the enemies of coniferous trees there are several which came to our notice during 1908 and 1909. The pine-leaf scale (*Chionaspis pinifoliae*) was reported as seriously infesting both pine and spruce during both years. In June 1909 the pine tree scale was reported from Geneva as injuring Black Hill spruce in that town. In July 1909 the writer investigated a rather serious outbreak of one of the pine tip moths, (*Evetria frustrana*) among the jack pines and Scotch pines in the Dismal River Forest Reserve near Halsey. The outbreak is described on a following page in greater detail. A species of bark-beetle (*Hylesinus opaculus*) was reported from Furnas county where it was proving serious as an enemy of cedars by causing the twigs to break off where the insects burrowed under the bark at their bases. This injury and the beetle causing it are illustrated on Plate 8. A leaf miner was also reported as affecting pines in Wayne county.

The white-marked tussock moth (*Hemerocampa leucostigma*) which was so abundant during 1907 and which was very common also during the earlier part of 1908, during this latter year was brought under complete control by its parasites so that during latter 1908 and 1909 it was not injurious; in fact in many localities was not even common. There was, however, a little trouble with this insect upon fruit and shade trees in the vicinity of Omaha during 1909. An account of the parasitism of this species is given elsewhere in this report. The fall web-worm (*Hyphantria cunea*) continued its injuries upon the shade trees unabated during the biennium here discussed. The trees most injured seem to be the elm, poplar, cottonwood and boxelder. Circular No. 5 of the office of State Entomologist contains an account of this common pest. Its work is illustrated on Plate 9.

Two large caterpillars proved injurious to plum foliage in various localities in this state during 1908 but neither to a serious extent. These were the larvae of the cecropia moth (*Samia cecropia*) and the plum sphinx (*Calasymbolus excaecatus*). The former of these was reported from several localities; the latter from Nance county only. The walnut caterpillar (*Datana angustii*) was quite injurious in the city of



PLATE 7. The Currant Slug (*Nematus ribesii*): Slugs arranged upon gooseberry leaves. (Original).



PLATE 8. The Cedar-twig Bark-beetle (*Hylesinus opaculus*): *a*, adult beetle; *b*, work of this insect at bases of cedar twigs. (Original).



PLATE 9. The Fall Webworm (*Hyphantria cunea*): at left, web on elm branch; at right, work on poplar leaves. (Original).

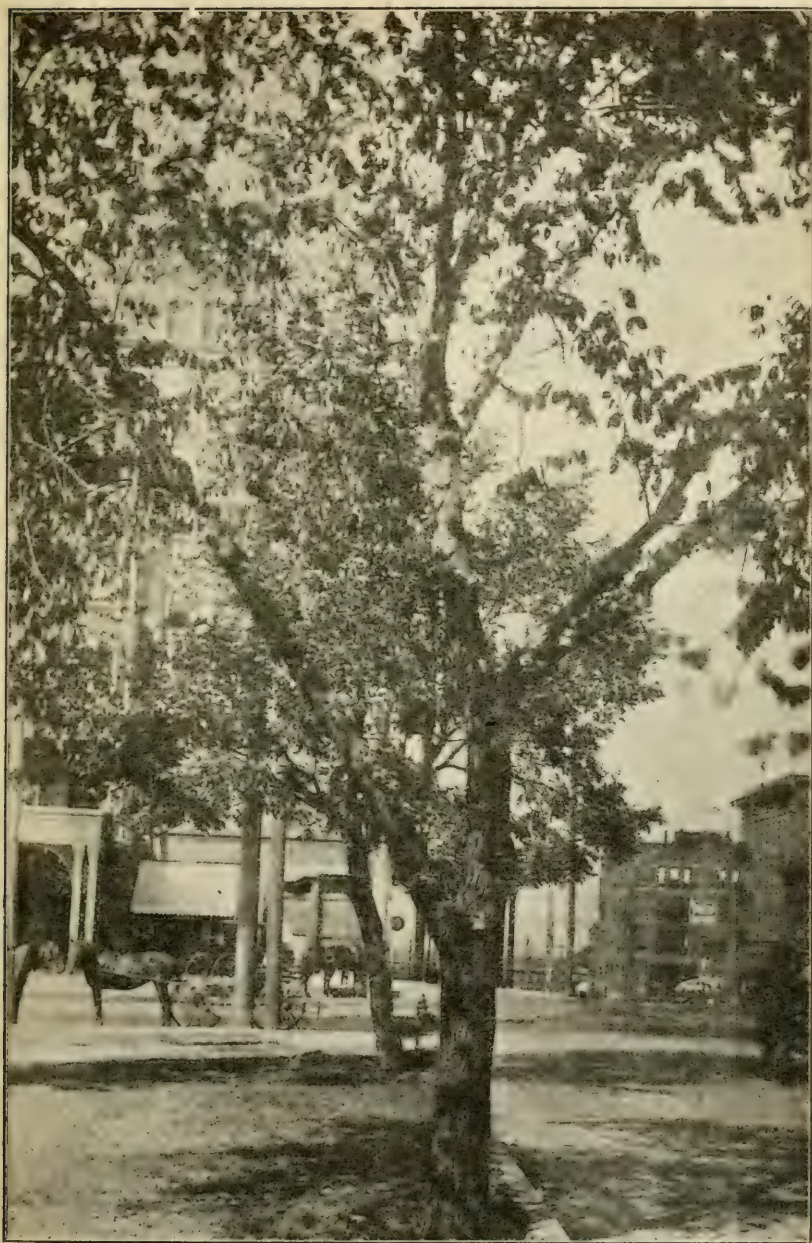


PLATE 10. The Woolly Elm Louse (*Schizoneura americana*). Affected tree showing cluster of lice. (Original).



PLATE 11. The Woolly Elm Louse (*Schizonura americana*. Clusters of lice on same tree much enlarged. (Original).

Lincoln during 1909, completely stripping the leaves from many fine trees and greating injuring others. This species will be found discussed on a subsequent page and is a close relative of the yellow-necked caterpillar (*Datana ministra*), a species which was also injurious during 1909 upon apple and haw trees in the state. In early July 1908 the Trees of Heaven (*Ailanthus*) upon the campus of the University Farm were distinctly injured by the larvae of *Atteva aurea*.

The elm scale (*Chionaspis americana*) proved severely injurious in Furnas county in the vicinity of Beaver City and in Colfax county in the vicinity of Schuyler. In the first mentioned locality the trees were badly infested and some killed during both years. There were also injuries during 1909 in Adams county. The elm-borer (*Saperda tridentata*) was another pest of this tree which was quite prominent in various towns in the state. Injuries were reported from Lincoln, Geneva, McCook and Crawford. During September of both 1908 and 1909 many elm branches were cut off from the trees on the Normal campus at Peru, due to the activity of a twig girdler (*Oncideres* sp.). The wooly elm aphid (*Schizoneura americana*) was abundant and injurious as during preceding years; an example of its work is shown on Plates 10 to 11.

The year 1908 from latter April until latter June was marked by an excessive abundance of the boxelder aphid (*Chaitophorous negundinis*). The reports of damage came from Webster, Nuckolls, Gage, Dodge, Antelope, Holt, Cherry, Sheridan, Custer, Dawson, Sherman, Howard, Greeley and Wheeler counties, thus embracing most of the central portion of the state. The injury in most localities was very severe, the trees swarming with the small aphids and being largely or entirely defoliated, some of the trees dying from the injury. Over mose of this area the trees had been similiary attacked the previous year and to a lesser extent during 1906 also. The abundance of the insects caused the issuance of Circular No. 1 of the office of State Entomologist which discussed its habits and means of control quite fully. During 1909 there was no trouble with this insect anywhere in the state. During May of 1908 there was also some damage by the cottony maple scale (*Pulvinaria innumerabilis*) in Lancaster, Thayer and Franklin counties on maple, boxelder and hackberry trees, bu the damage was neither severe nor extensive and completely disappeared during 1909. This insect will be fully discussed in the Horticultural report of 1906.

The cottonwood leaf-beetle (*Lina scripta*) was unusually severe in its attacks upon Carolina poplar and to a lessor extent upon cottonwood in several sections of the state during July and early August of both seasons covered by this report. More will be said concerning this species on a following page. The willow leaf-beetle *Lina lapponica* worked with the preceding species and in some localities was quite destructive. During 1909 there were reports of injury to Carolina poplar and cottonwood by an undetermined species of borer, this insect in some cases causing the death of the trees. The willow scale was reported as working injuriously on poplar during middle June 1909. The

most conspicuous enemy of the ash during the biennium of 1908-1909, was the ash pemphigus (*Pemphigus fraxinifolii*), a small aphid which attacks the leaves and causes them to curl badly and die. Instances of rather serious prevalence of this pest were reported from Gage, Adams and Sherman counties during July and August of both seasons. The ash borer (*Trochilium fraxini*) injured this tree in several localities, notably about Hastings and Alliance. The black locust trees in certain parts of southwestern Nebraska were injured by a borer, probably *Cyllene robiniae*, during 1908.

Among the insect enemies of garden flowers one of the most destructive was the pea louse (*Nectarophora destructor*), which during both years greatly injured the sweet peas in several localities in eastern Nebraska. Red spider proved another prolific source of injury on sweet peas. Snow-ball bushes in northern Nebraska were injured by the snow-ball louse (*Aphis virburni*) while during July 1908 the sumac louse (*Rhopalosiphum rhois*) occurred in destructive abundance upon that plant in the vicinity of Lincoln. There were instances of asparagus ferns being injured by the asparagus scale (*Aspidiotus hederae*). The verbenas at the University Farm were severely injured during latter August of 1909 by a small lepidopterous larva working in the tips of the stems. This larva was reared, but its species has not been determined nor has its life-history been worked out.

The Peach-Tree Borer—(*Samnina exitosa* Say).

This insect is one of the most important of our Nebraska horticultural pests, and, next to the plum curculio, is probably the most injurious insect enemy of the stone fruits in this state. The pest is one indigenous to the American continent and has been counted as a formidable enemy of the peach for over a century. Originally it worked upon the various kinds of wild cherries and plums in its habitat, but at the present time is thought of almost entirely in connection with its attack on cultivated varieties. It occurs at the present time over all of the eastern United States west of the Rocky Mountains.

The workings of the larvae of this insect just below the bark about the bases of peach, cherry and plum trees causes the exudation of a dark colored gum, which enables the ready detection of the injury. The larvae mine about just below the bark, often girdling the trees, and if they are present in numbers will quickly cause their death. Quite frequently, too, the larvae may be found burrowing about the bases of the larger branches, especially of the older trees.

The peach tree borer is a single brooded insect. Its parent is a very handsome, dark blue, slender-bodied moth which in the female has a broad orange band on the middle of the abdomen. This moth belongs to the family of clear-winged moths (*Sesiidae*) which are remarkable for the fact that the wings are more or less denuded of the customary covering of colored scales, so that they appear transparent. The female moth has only the hind wings thus clear, and is about an inch and a

half in extent of wings; the male moth has both wings clear and is distinctly smaller than the female. These moths appear in late June or early July and lay their eggs upon the bark of the tree, usually near the ground, but in some cases in the crotches. The egg is exceedingly small and of a yellowish brown color. Immediately upon its hatching, which soon takes place, the tiny larva actively crawls about and soon burrows into the bark by entering through a crack. It mines down to the sapwood at or sometimes below the level of the outside soil in young trees, or about the base of the limbs in older trees, growing during the summer and early fall and meanwhile enlarging its burrows and causing the characteristic exudations of sap mixed with wood dust and dirt. When winter arrives the larva ceases feeding and remains dormant through the cold weather, resuming its burrowing and feeding the next spring and completing its growth at that time. The full growth is reached toward the middle of June. When full grown the larva is about an inch long, yellowish-white with the head and segment just behind it brown. It then pupates, and, in course of three weeks or thereabouts, gives forth the adult moth already described.

The peach-tree borer is an exceedingly hard insect to successfully combat. Among the most successful preventives are the various means employed to prevent the moths laying their eggs about the bases of the young trees. Some mound up earth to the height of a foot or so about the bases of the trees early in June and keep it thus for the next three months, this method being particularly adapted to the protection of nursery stock. On other trees it is often possible to employ somewhat more elaborate and efficient protections such as tightly wrapping the base of the tree with heavy roofing or sheathing paper and seeing that this extends for an inch or two below the level of the soil, or any other method which will prevent the larva gaining access to the base of the tree. Another preventive is the application of poisoned limy coats to the lower trunk of the tree to prevent the laying of eggs and the entrance of the larva. A wash made of two quarts of strong soap and an ounce or two of Paris green with a little carbolic acid added, and these mixed in a bucket full of water with enough lime to make a paste, has proved satisfactory for this purpose. The small amount of poison included will not injure the trees, but no more than above mentioned should be used and this only with lime. Mixtures containing more arsenic will inevitably injure peach trees. Other substances which have proved successful as preventives of injury by this insect under certain conditions of environment, under different conditions have proved ineffective or injured the trees, so need not be further mentioned here.

After the larvae have located under the bark of the trees, ordinarily the best means of destroying them is by simply digging them out with a sharp knife, which is, in the end, the most effective treatment at this stage. After some experience this digging out can be done very rapidly and without serious injury to the tree. It can be done to best advantage during the early spring when the borers are most easily located and are

larger in size. The usual treatment for boring insects, fumigation by carbon bisulphide, is not recommended against the peach borer because of the generally more or less closed condition of the burrows of the larvae and the fact that its use apparently injures the health of the tree. It is said that applications of boiling water about the base of the tree will destroy the larva, but the expediency of this method is questionable. In dealing with this insect it is well to keep up the various means of control here mentioned from year to year upon all the stone fruit trees in the orchard, and thus prevent the insect from becoming very common.

The Fruit-tree Bark-beetle—(*Scolytus rugulosus* Ratz).

Another one of our common Nebraska horticultural pests is known to entomologists under the above name but is also frequently termed the "shot-borer" because its presence is made apparent by the appearance of many small round holes in the outer bark of the tree resembling shot holes. These holes are formed by the parent beetles in entering the bark to deposit their eggs and by the newly formed beetles which have developed under the bark in emerging for the purpose of dissemination among the trees of the orchard. They may be found, not only in plum, cherry and peach, but also in the apple and pear and other trees. In attacking stone fruit trees there is likely to be an exudation of gum at these holes.

The insect causing this injury is a small beetle about one-tenth of an inch long, in color black, with the tips of the wing-covers and part of the legs dull red. It belongs to the family of bark beetles (*Scolytidae*) and it a native of Europe. It was first observed in this country injuring peach trees in 1877 and within a few years established itself over all of the eastern states east of the Rocky mountains from New England, New York and Michigan, south to Georgia, Alabama and Arkansas.

This insect is particularly likely to attack trees after they have been injured by the peach-tree borer or through some other cause, and it may be said that as a rule the attack by these bark-beetles is confined to diseased and injured trees. But sometimes perfectly sound trees are severely attacked and sometimes seriously injured by the fruit-tree bark-beetle. Peach trees in full vitality are likely to repel the beetles by the abundant gummy exudations, so that they soon desert their burrows and seek other trees, but when the vitality of the tree is lowered so that these copious exudations cease a heavy attack and early death of the tree is likely to follow. The beetles early in the spring burrow into the small terminal twigs, causing their death and the wilting of the leaves they bear.

The first beetles make their appearance quite early in the spring, when they crawl about over the orchard trees and penetrate through the bark into the sapwood. The female beetle then forms in the bark and adjacent wood a large vertical brood gallery from one-half to two inches in length, and along the sides of this she constructs many little side pockets in which she lays her eggs. The construction of this gallery is completed in less than a week. Within three days these eggs hatch

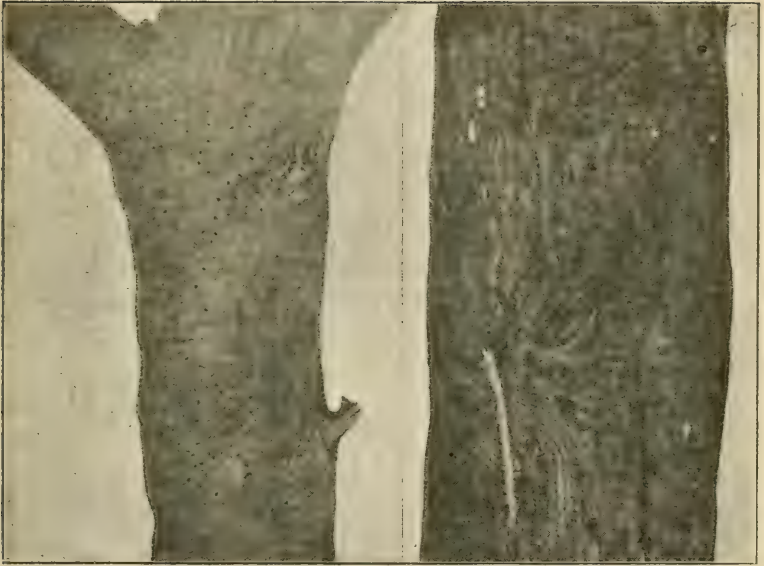


PLATE 12. The Fruit-tree Bark-beetle (*Scolytus regulosus*): at left, portion of trunk of cherry tree showing exit holes of the beetles; at right, appearance of the brood galleries of the insect after the removal of the bark. (Original).

into tiny whitish grubs which start the excavation of side galleries at right angles to the principal gallery formed by the parent. These lateral galleries increasing in bore with the growth of the larvae, and about eighty of them are produced by the progeny of each female. In about twenty days the young larvae have reached maturity, and form in the wood at the end of the gallery an oval chamber and there go into the pupal stage. A week or ten days later the beetles burrow out directly through the bark forming one of the "shot holes" previously mentioned. The development of the brood therefore requires from four to six weeks. Two or possibly three of such broods are produced annually, the insect remaining over winter within its chamber under the bark in the beetle, larva or egg stage.

Because of the fact that this insect continues breeding through the entire season, that it occurs over all portions of the tree and that it is exceedingly abundant, the use of such preventives as mentioned for the peach-tree borer lose much of their value when applied against this species. Wrappings of paper about the trunk and limbs will of course, prevent the insect burrowing in at these points while the application of different deterrent washes also in a measure protects the treated portions of the tree. Soft soap dissolved in water and soda until of the consistency of paint, or soft soap mixed with crude carbolic acid in water at the rate of one gallon of soap to one pint of acid in eight gallons of water should be applied thoroughly with a brush, and as much of the tree as possible should be covered with it. For effective protection it must be periodically renewed, the first application being made with the first warm days of spring. Moreover, these applications will not prevent injury to the twigs and the smaller branches.

But after all, the principal means against this insect is the practice of clean culture. Allowing pruned branches and brush wood to accumulate about the orchards or allowing infested trees which are dying from attack to remain in the orchard, serve to form an abundance of choice breeding material and prove centers of infestation for the other trees. Trees only slightly attacked should be protected from further injury by the means above described but trees dying from the attack of this or other insects or any disease should be cut out and burned at once. This will discourage the pest by creating a dearth of food material and forcing it to attack healthy trees, which as we have seen, it prefers not to do. By keeping the trees in the best possible condition they will then be enabled to withstand this comparatively light attack, especially where the affected trees are protected by the above mentioned washes.

The Grape-berry Moth—(*Eudemis botrana* Schiff).

The grape-berry moth is an insect which has been imported into America from southern Europe, and at the present time occurs over most of the United States where grapes are grown to any extent. Here in Nebraska it has become seriously injurious only within recent years. Injury by this insect is noticeable when the grapes berries begin to

ripen. When many of them show discolored spots and the berries themselves become shrunken, an examination of these injured fruits will reveal the presence of a small whitish larva which has burrowed through the pulp from the original discolored spot. The attack may involve also the seeds of the grape. These larvae may pass from one berry to another spinning silken strands between the attacked berries as they do so and causing the exudation of the juices of the fruit. The general appearance of the injury is much like that produced by the disease known as black rot.

As the larva becomes full grown it turns darker in color, assuming a deep greenish or brownish hue. Then it leaves the grape, and, migrating to a leaf, cuts out a little flap in the grape leaf which it folds over and fastens with silk, thus forming a little pocket in which it transforms into the pupa stage. In ten or twelve days a small slate colored moth with reddish brown markings emerges from this leaf pocket and soon commences depositing eggs for the next brood of larvae. This applies to the second and third broods of the insect, which develop on the green grapes in July and on the ripening grapes in August and September. The first brood of this insect is usually quite small and produces no obvious harm, so that usually no protective measures are taken against it, but in the second and third broods the insect multiplies very rapidly and may become very numerous and destructive. The last brood of larvae remains in the pockets it has formed through the winter and gives forth moths early in the spring, which deposit eggs to form the first brood of the next year.

The grape-berry moth attacks all varieties of grapes but especially the tender skinned sorts which form dense bunches. Aside from grapes it may breed in the seed bunches of sumac and in tulip and magnolia leaves. Instances of the destruction of one-half to three quarters of a grape crop by this insect have occurred in several grape growing regions of the eastern United States.

The chief means of controlling the grape-berry moth, especially in the larger vineyards is to promptly collect and burn all the fallen leaves and badly injured fruit in the fall, thus destroying the hibernating brood of larvae and pupae. Early gathering and shipping of the fruit removes the larvae from the vineyards before they have left the berries and located in the leaves. The destruction of the fallen fruit is also helpful. The practice of bagging the grape cluster as soon as the fruit has set is an adequate protection against this insect and also against the black rot of the grape. Spraying is useful only against the first brood, which develops on the leaves and tendrils of the vine, and, owing to the small numbers of this brood and its probable diffusion upon other plants beside the grape, the value of this treatment is largely offset.

The Mulberry Borer—(*Dorchaschema alternatum* Say).

This round headed borer proved to be a serious pest among the mulberry tree in the vicinity of Lincoln during the spring of 1908. The injur-

ies were first noticed on June 21, when it was observed that the branches of the trees and sometimes the entire tree, were so badly injured by the workings of this borer that they were in a dead or dying condition. Examination of the affected branches showed that the larvae, shortly after penetrating the bark, wandered about in the cambium layer for some time, then penetrated to the heartwood of the tree. In the smaller branches they would follow the pithy center almost to their tips.

At the time these injuries were discovered a braconid parasite was noted in considerable numbers ovipositing in the affected branches and twigs. Material was collected for the purpose of determining the extent of this parasitism with the following result:

Date	Beetles emerged	Female para- sites emerged	Male parasites emerged
June 8	28	4	4
June 10	17	3	1
June 11	2	2	
July 11			1
June 13		1	
June 15	13	3	3
June 17	5	2	1
June 18	2		2
June 19		2	
June 22	5	2	4
June 29	4	5	1
July 1	3	1	
July 13	3		
	82	25	17

Thus from June 8th to July 13th, eighty-two beetles and forty-two parasites emerged, demonstrating that fifty percent of the larvae working in the stems were parasitized by this braconid.

At the time of the beginning of this investigation, on June 8th, the cutting open of a large number of branches revealed the fact that most of the insects were in the pupa stage and a very few were almost transformed into beetles ready to emerge. There were numerous half-grown larvae varying in size from very small to full grown. On June 17th, a proportionately greater number of the larvae were full grown. On July 13th, practically all of the larvae were half to full grown and had left their position under the bark and entered into the heartwood. The insects pupate in their burrows near the exterior of the tree, the beetles gnawing their way out from the pupa chamber after development, this being through three to five millimeters of wood.

This insect was described by Say in 1832 as *Saperda alternata* (Journ. Acad. Phil. III p. 504). Haldeman in 1847 (Trans. Am. Phil. X, p. 54) mentioned the species, and LeConte in 1852 (Journ. Acad. Phil. ser. 2

II, p. 147) placed it in the genus *Dorchaschema*. The genus includes two other species: *wildii*, Uhler (1855) known from Maine, Pennsylvania, Ohio and Indiana, and *nigrum*, Say (1827) which ranges from Massachusetts, New Jersey and Virginia west to Illinois, north to Canada and south to Louisiana. *D. nigrum* breeds in hickory; *D. alternatum* and *D. wildii* breed in mulberry and osage orange. *D. alternatum* is known to occur in New York, New Jersey, Pennsylvania, Maryland, the Carolinas, Ohio, Illinois, Nebraska, Kansas and Texas.

This is not the first record of the serious abundance of this insect. P. Laurent, in 1898, recorded both *wildii* and *alternatum* as injuring osage orange (Ent. News, pp. 33-34), and E. A. Popenoe recorded both these species as injurious in Kansas the same year (Trans. Kans. State Hort. Soc., pp. 40-46). We shall examine for more cases of injury by this insect and if we find it serious will complete our studies of its life-history.

The Pine-tip Moth—(*Evetria frustrana*).

Complaints of injury to the young tips of the young jack and scotch pines on the Forest Reserve near Halsey, Nebraska, received from the supervisor of the reserve instigated an investigation by the writer on July 10. The infested trees were carefully examined and it was found that about thirty-five per cent of the new tips were affected by this insect and practically all of them dead and brown. The affected trees were in the older grove just south of the reserve buildings, where the jack pines were about six feet high and all the smaller scotch pines were scattered among them. Both species of pine were apparently equally affected by the insects.

The injury first became manifest to the supervisor on the last day of June, when the excessive exudations of resin and rapidly browning needles of the tips of the shoots became rather conspicuous. Later these dead needles dropped. The larvae causing the damage would burrow in the stems for one to three inches, usually pupating near the tip and later emerging therefrom, after the pupa had partly pushed its way out. Sometimes, however, the point of attack was located an inch or two below the tip in which case the tip became brown and curled and the moth emerged from the sides. On Plate 13 this moth and its injuries are illustrated.

On July 12 most of the moths emerged from the tips and were flying about among the pines. Several would often be found in a single tree near the tips of the branches. Opening a number of the tips revealed the fact that the occupants were mostly gone, as the shed pupal skins were very abundant and the living pupae and moths comparatively few.

At the time of this examination specimens of a small black ichneumon were observed biting among the trees and in order to determine the extent to the parasitism a number of affected twigs were collected and placed in breeding jars. The affected twigs of jack pine (*Pinus divaricata*)



PLATE 13. The Pine-tip Moth (*Eretzia frustrana*): above, the moth; at left pupa in opened tip; at right, tip showing manner of emergence of the moths. (Original.)



PLATE 14. Work of the Pine-tip Moth: above, work in tips of jack pine; in middle, work in middle of Scotch pine; below, work in jack pine when the larvae enter above the tip. (Original).

were placed in one jar and those of the scotch pine (*Pinus syvestris*) in another. From the twigs of jack pine on July 14 there emerged eleven moths and one ichneumon; on July 15, four moths and one chalcid parasite; on July 16, eight moths and five chalcid parasites; on July 17, two ichneumons and one chalcid parasite; on July 21, one moth and one chalcid parasite. From the cage of scotch pine twigs on July 14, two moths emerged; on July 16 another moth and on July 17 another moth; no parasites were reared from these twigs.

The eleven which emerged July 14 from the jack pines were placed in a breeding jar to observe the oviposition. On July 17 the needles and the walls of the breeding jar were abundantly provided with eggs which had been laid by the moths. These eggs were very small, fiat and yellowish in color and were laid indiscriminately over the needles of the pine. The moths bred from these twigs have been identified by competent authorities as *Evetria frustrana*. The manner of introduction of the insect into the isolated pine grove is difficult to account for; they may have been carried over by the winds from the Pine Ridge to the northwest, but it is more probable that they were brought in on young trees, and multiplied and spread from these introduced pines. Pine stock has been imported from New York, Minnesota, Michigan and Wisconsin in small numbers, according to the supervisor, and it is possible the insect was brought in with one of these importations.

Parasitism of the White-Marked Tussock Moth in 1908.

During early July of 1908 it was evident that the first brood of the tussock moth was undergoing a very heavy parasitic infestation, since the number of cocoons brought into the laboratory yielded specimens of various species of both hymenopterous and dipterous parasites of this species. In order to gain some idea of the exact extent of this parasitism the following experiments were planned and carried out by Mr. C. H. Gable and R. W. Dawson, both then in the employ of the State Entomologist. The following statement of the result of the experiments has been prepared by Mr. Gable.

The only dipterous parasite reared was the Tachinid, *Frontina frenchii*, a primary parasite of the tussock moth. There were also reared three species of *Pimpla*, all primary on the tussock stock, but the predominating species was *P. inquisitoriella* D. T.; in fact in the following experiments all the specimens reared were of this species except one specimen each of *P. conquisitor* Say, and *P. annulipes* Say. A fifth species of primary parasite was *Chalcis ovata*. The only secondary parasite reared was *Dibrachys boucheanus* which attacked both the *Pimpla* and *Frontina*. As many as thirty-two specimens of the hyperparasite were reared from a single cocoon.

EXPERIMENT NO. 1.

On July 9, 1908, 250 cocoons of *H. leucostigma* were collected in Lincoln. These cocoons containing the following:

Cocoons containing caterpillars not yet transformed into pupae.....	47
Cocoons from which <i>Frontina frenchii</i> had emerged.....	3
Cocoons with male moths emerged.....	12
Cocoons with female moths emerged.....	3
Cocoons with obviously parasitized pupae.....	39
Cocoons with pupae not obviously parasitized.....	146

250

From these 185 cocoons including both parasitized and not obviously parasitized ones moths emerged as follows:

	Males.	Females.
July 13.....	5	1
" 14.....		2
" 16.....	2	
" 17.....	2	
" 18.....	3	
	12	3

Total moths emerged 15. Deducting these 15 cocoons which produced moths the following results were obtained from the 170 cocoons remaining, some of which, however, produced nothing:

<i>Pimpla</i> sp.	<i>Frontina frenchii</i> .	<i>Chalcis ovata</i> .	<i>Dibrachys</i> <i>boucheanus</i> .
July 13..... 6	July 24..... 1	July 24..... 1	July 16..... 31
" 14..... 1			" 21..... 3
" 15..... 5			" 23..... 37
" 16..... 7			" 24..... 22
" 17..... 37			" 25..... 100
" 18..... 1			" 27..... 12
" 20..... 1			" 27..... 184
" 21..... 1			
" 27..... 3			
	62	1	389

EXPERIMENT NO. 2.

On July 14, 1908, 150 cocoons of *H. leucostigma* were collected at Lincoln, by Mr. C. H. Gable and R. W. Dawson. These cocoons contained the following:

Cocoons containing nothing	2
Cocoons containing dried up caterpillars.....	16
Cocoons containing putrid chrysalis.....	1
Cocoons containing dead caterpillar and <i>Chrysopa</i> larva attached.....	1
Cocoons with chrysalid contents apparently eaten by some predaceous insect	4
Cocoons with contents eaten by <i>Podisus spinosus</i> (bugs observed feeding)	2

Cocoons with male moths emerged	22
Cocoons with female moths emerged	10
Cocoons with contents placed in vials.....	92

 150

From the contents of the 92 cocoons placed in vials moths emerged as follows:

	Males.	Females.
July 15.....	1	3
" 16.....	5	7
" 17.....	5	3
" 18.....	3	4
" 20.....	5	4
" 21.....	2	3
" 22.....	1	
" 23.....	2	
" 25.....	1	
	—	—
	25	24

Deducting the 49 cocoons from which moths emerged there were left 44 cocoons. Although nothing emerged from some of them, the following parasites issued:

<i>Pimpla</i> sp.	<i>Dibrachys boucheanus</i> .
July 15.....	2
" 16.....	2
" 17.....	2
" 20.....	7
" 28.....	1
	—
	14
	—
	71

The Walnut Caterpillar—(*Datana angusii* Grote & Robinson)

In the report for last year the yellow-necked apple-tree caterpillar (*Datana ministra*) was discussed in some detail. Attention is here drawn to a very similar and closely related species which, in company with the preceding, occurs very commonly upon the walnut and frequently in such numbers as to largely or entirely defoliate the trees as is shown on Plate 15. This species may be told from *ministra* by the fact that the segment just behind the head is entirely black instead of entirely yellow. It is also a less general feeder occurring almost entirely on walnut and hickory. Its life-history is essentially like that described for *Datana ministra* including the gregarious molting habit (Plate 16) and the means of controlling it are identical.

The Cottonwood Leaf-Beetle—(*Lina scripta* fabricius).

The cottonwoods, poplars, and willows of Nebraska and other states immediatly to the north and south have for many years past been seriously injured by this insect. The species is, perhaps, primarily an

enemy of the willow, but ordinarily is not injurious to that plant, or but slightly so. For cottonwood, however, it has acquired an exceeding fondness, and frequently occurs in excessive abundance upon this tree, where it works great destruction. As early as 1878 the tremendous destructive ability of this beetle upon the cottonwood was brought forcibly to notice in Kansas and Nebraska, and again in 1884 it was exceedingly injurious in Nebraska and South Dakota. As noted on a preceding page the last two years have been marked by much defoliation by this insect, and its close relative the spotted willow leaf-beetle, (*Lina lapponica*). These insects spend the winter as adult beetles. In early spring as the cottonwoods and poplars commence putting out their leaves the female beetles deposit their eggs on the under side of the leaves in masses of a few to a hundred eggs. The larvae which soon hatch from these eggs are black in color, and first skeletonize the leaf upon which the eggs were laid and then gradually diffuse over the tree as they grow older. With each successive molt they grow lighter in color, so that when full grown they are about three-eighths of an inch long, yellowish white with black legs and rows of tubercles upon the back and sides, some of which emit an exceedingly pungent milky liquid. They attach themselves to the leaf and go into the pupa stage, soon thereafter giving forth the adult beetles. As only two weeks are required during midsummer for the entire development from egg to adult, this species is enabled to complete four or five broods annually, increasing in abundance and destructiveness as the season advances.

The adult beetle of *scripta* is exceedingly variable with its markings, but usually the thorax is black bordered on each side with yellow, and the wing covers yellowish marked with broken lines of black. The beetle of *lapponica* is of a reddish brown color usually heavily spotted with black. The larvae of the two species are so similar as to be practically indistinguishable. The willow leaf-beetle, however, as its name indicates, is somewhat more partial to the foliage of the willow. The life-history of *scripta* above given is essentially true with *lapponica* also.

The most effective means of combating both these important shade tree pests is a thorough spraying with arsenical poisons. But the results are not always entirely satisfactory. The smooth leaf surface especially of the willow causes the spray to tend to collect in drops and roll from the foliage, also the habit of the beetles and grubs of feeding on the under surface of the leaves to a considerable extent makes it difficult to lodge the poison effectively. The best results are to be obtained by a heavy application of arsenate of lead at the rate of two pounds to fifty gallons of water, early in the season before the beetles get much of a start. This application must be renewed as necessary from time to time during the summer, but the adhesiveness of the lead arsenate makes very frequent reapplications unnecessary. In some places the shaking off and collecting in kerosene troughs of the beetles and larvae has been successfully practiced, somewhat after the manner used in jarring for the plum curculio. This is, however, too laborious and expensive to admit of very general practice.

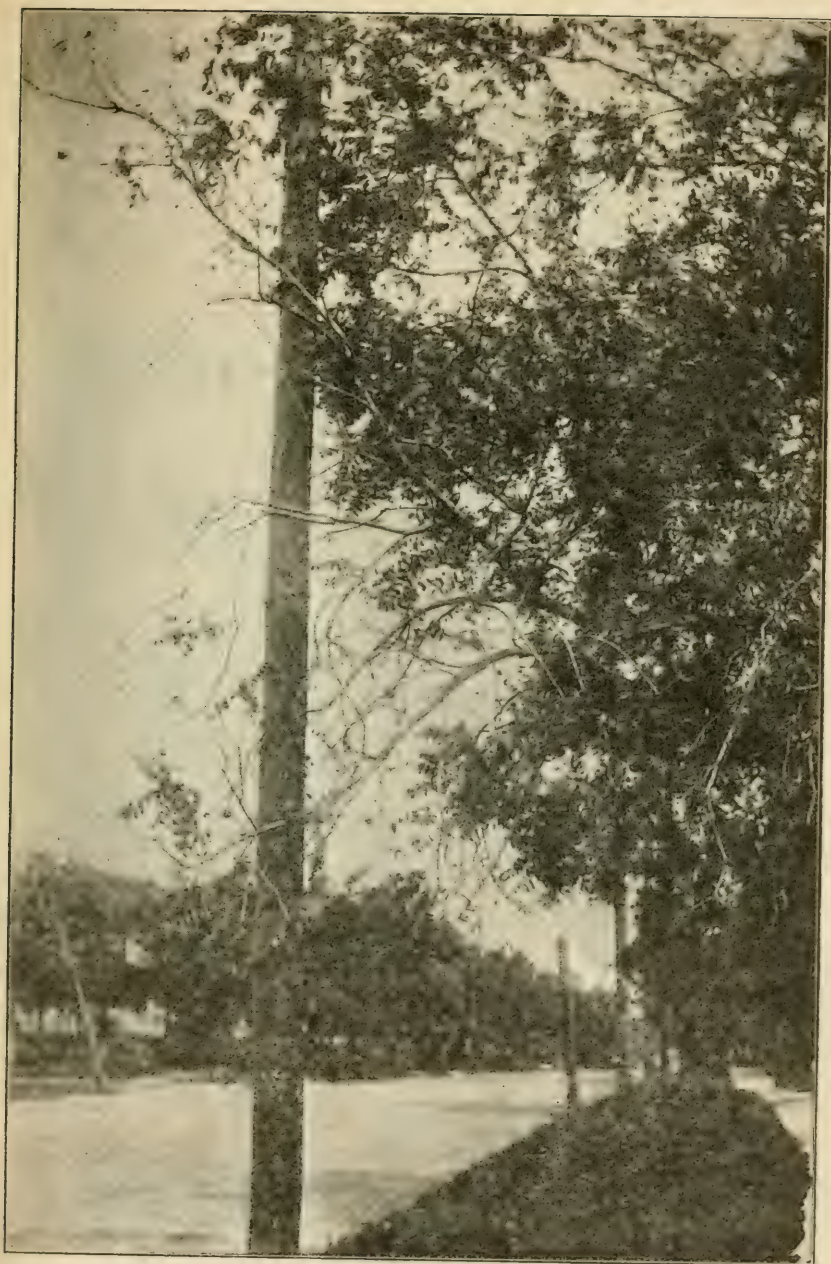


PLATE 15. Walnut tree partly defoliated by larvae of *Datana angusii*.
(Original).

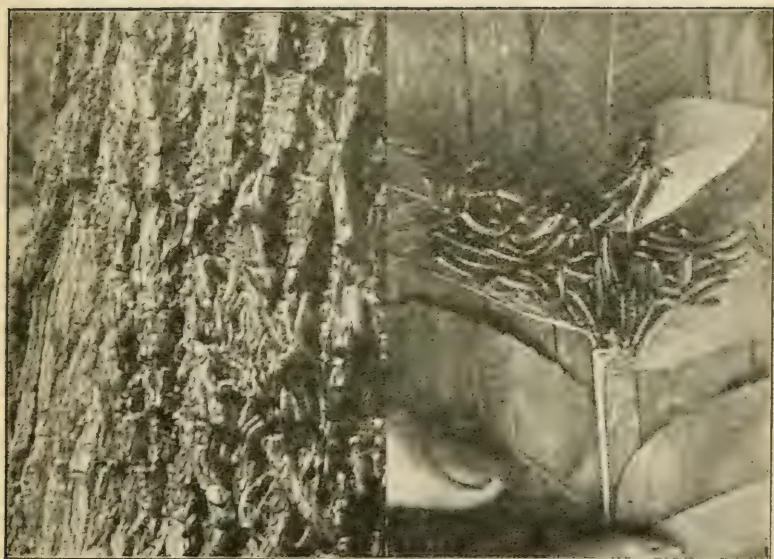


PLATE 16. Half-grown larvae of walnut caterpillars moulting on tree trunk; younger larvae on leaf. (Original):

The House Fly.

Beware of the Dangerous House-Fly! Wherever he goes death and disease may follow. War to the death should be declared upon the little pest. His presence is a disgrace. His touch may be deadly. Either man must kill the fly or the fly will kill the man. If there is no dirt and filth there will be no flies. There will be fewer dead babies if there are no flies.

Again Your Attention is Called to the Dangerous House-Fly.

It is at this time of the year that the house fly begins to take on life for the ensuing spring and summer; eggs laid last fall will soon begin to hatch. At first he is only a little worm, wriggling his tiny grub-like form in some incubating pile of filth. He is usually found in the manure pile, the outhouse or the mound of rubbish or garbage in the back yard. In this condition he is easily killed—and it should be the duty of every person to kill him now. The house-fly could not exist if everything were kept perfectly clean and sanitary. Exterminate the fly worm; do away with its breeding places and there will be no flies. If we are to fight the flies this summer we should use every agency possible, and the best way to fight them is to prevent their breeding.

The common house-fly is coming to be known as the "typhoid fly"; and when the term becomes universal greater care will be exercised in protecting the house from his presence.

Flies kill a greater number of human beings than all the beasts of prey, with all of the poisonous serpents added. They spread disease which slays thousands, while big, powerful beasts kill single victims.

As soon as the fly comes out of his shell he is full grown and starts out in the world to make a living, and if your home is not clean he knows it by the odor. They can discern an odor of filth for miles.

As much as they like filth odors they dislike other odors. Where a bad odor will attract them the clean odor will repulse them. A pleasant smelling substance—the fragrance of flowers, geraniums, mignonette, lavender or any perfumery—will drive them away.

He is a frequenter of offal; the fly lays her eggs in the manure pile or other objectionable filth. All the germs—all the imagable, abominable microbes—fasten themselves on the spongy feet of the fly. He brings them into the house and wipes them off his feet. The fly you see walking over the food you are about to eat is covered with filth and germs. If there is any dirt in house or about your premises, or those of your neighbors, he has just come from it. It is his home. Watch him as he stands on the lump of sugar industriously wiping his feet. He is wiping off the disease germs; rubbing them on the sugar that you are going to eat, leaving the poison for you to swallow.

He wipes his feet on the food that you eat, on the faces and on the lips of your sleeping children. This does more to spread typhoid fever and cholera infantum and other intestinal diseases than any other cause.

Disease attacks human beings only when they are brought in con-

tact with it. For instance, you cannot get typhoid fever unless you swallow the germ of typhoid, and you do not swallow these germs unless they get on the food you eat or in the liquids you drink, or on the glasses or cups from which you drink.

Not only does he scatter the seeds of disease from his body over your food, but before your fruit and vegetables are placed before you they have been subjected to his filthy habits, either in the kitchen or in the stores where he flies from the horse dirt in the middle of the street to the tubercular sputum on the sidewalk, and then back to the food stuffs displayed for sale.

Many diseases which are attributed to milk and water originate through flies. A polluted brook, river or lake furnishes germs from sewers and flies in millions settle on the refuse that washes along the water's edge.

Intestinal disease are more frequent whenever and wherever flies are most abundant, and they, and not the summer heat are the active agents in its spread.

There is special danger when flies drop into such fluid as milk. This forms an ideal culture material for the bacillus. A few germs washed from the body of one fly may develop into millions within a few hours, and the person who drinks such milk will receive large doses of bacilli, which may later cause serious sickness.

Therefore, keep the flies away from the milk.

Don't's.

Don't allow flies in your house.

Don't permit them near your food, especially milk.

Don't buy food stuff where flies are tolerated.

Don't have feeding places where flies can load themselves with ejection from typhoid or dysenteric patients.

Don't allow your fruits and confections to be exposed to the swarms of flies.

Don't let flies crawl over the baby's mouth and swarm upon the nipple of its nursing bottle.

Summary.

Clean up your premises inside and out and then, as much as you can, see that others do the same.

Strike at the root of the evil. The house-fly breeds in horse manure, kitchen offal, and the like. Dispose of these materials in such a way that the house-fly cannot propagate.

Screen all windows and doors and insist that your grocer, butcher, baker and every one from whom you buy food stuffs does the same.

After you have cleaned up your own premises inspect the neighborhood for fly-breeding places. Call the attention of the owner to them and if he does not remove them, complain to the Board of Health.

Flies breed in horse manure, decaying vegetables, dead animals and all kinds of filth.

Not less than 95 per cent of the pests are bred in the stable.

All stables should have a manure bin with a door at the side and a wire screen on the top, that the larva deposited in the manure before it was placed in the bin will be screened when hatched, and as flies seek light and come to the top of the bin they can be easily killed by burning paper or some other device.

The fly has a thirst only equalled by his hunger; place a dish of poisoned water in the stable and a greater part of the flies hatched there will be killed.

Flies are nature's scavengers, fulfilling the same function that some bacteria do, but become an intolerable nuisance and danger when entering human dwellings and by contamination of food.

The presence of flies is a direct evidence of careless housekeeping and of the existence of filth in some form about the premises, and are more dangerous than the good housekeeper's terror found in bed rooms.

Remember that wherever absolute cleanliness prevails there will be no flies.

Look after the garbage cans. See that they are cleaned, sprinkled with lime or kerosene oil and closely covered.

Remove all manure from stables every three or four days, and when removed keep in a tight pit or vault, so flies cannot breed in it.

Lye, Chloride of Lime or Blue Vitriol Water, Crude Carbolic Acid or any kind of disinfectant may be used.

Keep flies away from the kitchen. Keep flies out of the dining room and away from the sick, especially from those ill with contagious diseases.

Screen All Food.—Apply this rule not only to food prepared at home, but to food stuffs offered for sale, and especially fruits, salads and all other things which do not require to be cooked.

Prevent consumptives from expectorating where flies can feed upon it.

How to Kill Flies.

To clear rooms of flies carbolic acid may be used as follows: Heat a shovel or any similar article and drop thereon 20 drops of carbolic acid. The vapor kills the flies.

A cheap and perfectly reliable fly poison, one which is not dangerous to human life, is Bichromate of Potash in solution. Dissolve one dram, which can be bought at any drug store, in two ounces of water, and add a little sugar. Put some of this solution in shallow dishes, and distribute them about the house.

Sticky fly paper, traps and liquid poisons are among the things to use in killing flies, but the latest, cheapest and best is a solution of formalin or formaldehyde in water. A spoonful of this liquid put into a quarter of a pint of water and exposed in the room, will be enough to kill all the flies.

To quickly clear the room where there are many flies, burn

pyrethrum powder in the room. This stupefies the flies when they may be swept up and burned.

If there are flies in the dining room of your hotel, restaurant or boarding house, complain to the proprietor that the premises are not clean.

PARASITISM.

Charles H. Gable, Lincoln.

The cultural methods and the employment of poisonous sprays as means of fighting injurious insects are well and generally understood, but few appreciate, however, the role which natural enemies play in holding in check the increase of our insect pests. It is the object of this paper not only to give some of the principles of parasitism but to give a discussion of its extent and efficiency as well as a brief description of the groups of insects involved.

We will not consider predaceous insects, parasites of mammals, nor the external or exo-parasites which the more popular definition might exclude. But as here used, "parasitism" denotes the relationship which exists between certain insects, called "parasites," which live, during some stage of their developement, within the bodies or eggs of other insects or "hosts."

The lives of most insects are divided into four distinct stages or periods: the egg stage; the larval or "worm" stage during which they do all of their growing; the pupa or resting stage during which the insects remain inactive, take no food, and are undergoing the transformation from the larval to the last or adult stage. The grasshoppers, katydids, the true bugs such as "stink-bugs," and some other groups do not have the pupal stage but remain active throughout life, reaching maturity by a steady process of growth. Parasitism is not confined to any one of these stages. Some parasites attack the egg, others the larva, while still others choose the pupa or adult as hosts. It is to be noted, however, that parasites which attack the eggs never molest the larvae. With few exceptions the work of each kind of parasite is confined to a particular stage of the host.

The family of insects called *Proctotrupidae* contains the largest majority of the egg parasites. They are tiny creatures, and of some it would take 160 placed end to end to make an inch in length. They may be furnished with four wings though some of them have no wings at all. Their color is usually a dead black, not at all shining. The most conspicuous character by which the females may be known is their ovipositor. This is a sting-like projection which extends from the very tip of the abdomen instead of the back a little on the under side, as is the case in other groups. With this ovipositor the parasite drills through the shell of the egg and deposits its own egg in the midst of the rich food supply. The egg of the parasite soon hatches and the little worm feasts on the contents of the egg. By the time the food is exhausted the worm is full grown and enters the pupa stage within the egg-shell. At the com-

pletion of this stage it "hatches" into a fully matured insect, eats a small round hole in the shell of the egg and starts on a search for more eggs to be victimized by the next generation. While the eggs have their parasites largely confined to the one group of family of insects, the larvae are not as fortunate, for their enemies are much more numerous and differ greatly in habits and general appearance. Two large divisions are represented: The two-winged insects or **Diptera** which are properly called flies, and four-winged insects or **Hymenoptera**, some of which might commonly be mistaken for small dark colored bees while others superficially resemble the long bodied wasps.

The parasitic flies are divided into four groups which may be recognized without much difficulty. The large group is composed of flies called **Tachinidae** and are the hardest to distinguish from their close relatives such as the house-fly, blow-flies, and flesh-flies. These characters, however, are sufficient to identify the group, namely: The presence of few or many spines scattered over the body, and the bristles on the antennae or "feelers" which are bare instead of feather-like. A second group, **Dexiidae**, closely resembles the **Tachinidae** and these flies may be distinguished by usually having longer and more slender legs and the bristles of the antennae being feather-like. The members of these groups which are destructive to moths and butterflies choose the larvae as hosts, never attacking the eggs or adults and seldom, if ever, the pupae. The egg is deposited on the skin or hair of the caterpillar to which it is fastened by a viscous fluid. When it hatches the little worm bores its way beneath the skin of the host. If the young parasite were to feed upon the vital parts of the caterpillar, the host would soon die and the body completely dry up long before the parasite reached maturity, but there is a wisdom which prompts the parasite to feed only on the fatty tissues of the body. This does not seem to greatly discommode the caterpillar which continues to eat and produce tissue for the little guest. It is only when the parasite becomes almost full grown that the caterpillar ceases to eat and begins to sicken and die. The larva of the parasite may leave the caterpillar and burrow in the ground or crawl to some protected place and there pupate, or it may pupate within the body of the host. In either case the caterpillar never recovers. There are some interesting observations with reference to this method of parasitism a few of which are worth mentioning at this time. Since all caterpillars shed skin several times before reaching maturity the effectiveness of Dipterous parasites is greatly lessened. The eggs may be attached to the back of a caterpillar shortly before a molt takes place, and the caterpillar may crawl away leaving the eggs attached to the empty skin; rejoicing, shall we say, at the narrow escape. In spite of this difficulty the army-worm plague which so often breaks out in various localities is usually, to a large extent if not completely, controlled by Tachinid parasites. A badly infested field will be simply swarming with these flies and owing to their numbers and their persistence in depositing eggs cause such mortality that few army-worms survive for the next

season. Many of our caterpillars have a dense covering of long hair which, we would suppose, might prove an effective protection by keeping the mother-by at a distance as she seeks a host for her progeny. This is not the case, however, for we find that the woolly-bears, the very hairiest of our caterpillars, are very frequently parasitized. The egg is attached to the hair and the young parasite after hatching wriggles down to the skin. It sometimes happens that the caterpillar is almost full grown before it is parasitized. In this case the caterpillar may spin its cocoon and even pupate before the parasite develops, but, as stated before, the host never, except possibly in very rare cases, reaches the adult stage.

The third group of flies parasitic on the larvae of other insects is called **Bombyliidae**. They are flies which are short and robust, usually with a thick covering of hair which gives them a downy appearance. The wings of many are beautifully mottled with brown or black. They are found most abundant about damp places in the woods, along the roads, or on flowers, and are extremely active in flight, hovering motionless in the air for a moment, then darting away so swiftly the eye cannot follow. Some of the Bombyliidae are parasite in the larvae of moths but the majority choose the larvae of our various wild bees for their hosts.



A Tachinid fly (*Belvosa bifasciata*).
[After Riley.]



A Bombylid fly (*Anthrax hypomelas*).
[From Insect Life.]

While this concludes the list of two-winged parasites, there are still three groups of four-winged or Hymenopterous parasites with which the larvae of our insects have to deal. These are by far the more numerous, and of much greater economic importance. They are easily distinguished from the flies by the presence of two pair of wings instead of only one pair. The females are provided, as are the egg parasites, with a long sting-like ovipositor which is used to penetrate the skin of the caterpillar and deposit the egg beneath. The story of the development of these parasites is so similar to that described previously that it need not be repeated. It is apparent that this method is much more effective than where the eggs are simply placed on the outside of the caterpillar and exposed to various accidents before hatching.

The Ichneumons, family **Ichneumonidae**, are the largest of the parasitic insects. The body is long, somewhat club-shaped, and these insects might easily be taken as a kind of wasp by the casual observer were it not for the long ovipositors of the females. One of our common and largest Ichneumons is **Thalessa lunator**. The body of this insect is about two and one-half inches in length while the ovipositor of the female is often seven inches long. This insect is parasitic upon the larvae of the Pigeon Horn-tail which bores in the trunks of trees. The female *Thalessa* runs up and down the trunk of an infested tree, nervously tapping on the bark till she finds a spot which she judges to be directly above a burrow. The ovipositor is then made to form a loop and by a rhythmic motion of the body made to penetrate the solid body of the tree till the burrow is reached which sometimes is at a depth of three or four inches.

The egg is deposited and, when hatched, the young larva crawls along the burrow until it comes in contact with the larva of the Pigeon Horn-tail. Upon this the parasite feeds until it pupates. After having passed through the resting stage, the adult insect emerges and gnaws its way to the outside.



The Long-tailed Ophion (*Ophion macrurum*)
an ichneumon. [After Riley.]

The Ophions present a different type although they are readily recognized as belonging to this group. The ovipositor, however, is not so conspicuous, and the abdomen, though somewhat club-shaped, is strangely flattened so that from above it looks like the edge of a knife blade, while from the side it is quite wide. Members of this group attack especially the larvae of our large silk-worm moths and some of our butterflies. This is a very interesting group but not of great importance since they do not work to a great extent at least upon any of our injurious insect pests.

A second group of the four-winged parasitic insects is the **Braconidae**. This is a large group of very small insects which cannot be described without a characterization which would be too technical for the purposes of this paper. The work, however, may be readily recognized since they act like none of the other parasites. Their method of pupation may be of two kinds, namely, external pupation where the larvae come outside of the caterpillar before entering the resting stage, and internal pupation where the larvae remain within the caterpillar in order to complete their development. Those which follow the first named method, that of external pupation, feed upon the fatty tissues of the host much the same as do other parasites. When parasites are full grown they worm their way through the skin on the back of the caterpillar until they are entirely outside except just enough of the tail to hold them sticking out perpendicular to the body of the host. Each of the larvae bends its head over and secures itself with a sticky fluid at the place of attachment then proceeds to spin a cocoon about itself. Infested caterpillars such as our "tomato-worm", "grape-wine worm," and others may often be seen with two or three hundred of these smooth white cocoons about half the diameter of a pencil lead and one-eighth of an inch long standing on end and pointing in all directions. When the



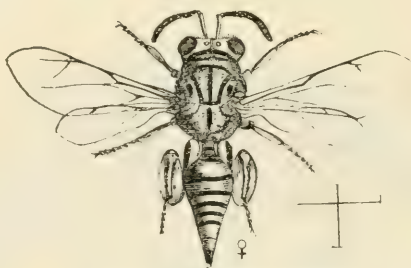
Larva of Tomato-worm with cocoons of braconid,
Apanteles congregatus attached. [After Weed.]

parasites are ready to emerge, which is usually long after the caterpillar is dead, they cut a neat round hole in the top of the cocoon and escape as full grown insects. Those which remain inside the host to pupate behave in a very different manner. When they are full grown they do not come through the skin as do the others, but line up side by side, with their heads all pointing toward the back of the caterpillar. When their cocoons are spun they make two, three, or four rows the length of the caterpillar. When the insects emerge, each one cuts a round hole in the dried skin of the back of the now dead caterpillar, making a regular pepper-box appearance.



Acronycta larva killed by a braconid,
Rhogas intermedius. [After Bruner.]

The next group to be considered is composed of very small or minute insects which are called **Chalcididae**. They may be known by their peculiar jumping habit, their antennae which have a distinct elbow joint, and their hind legs which usually, though not always, are considerably thickened. There is nothing striking in their method of attacking their hosts since they develop and pupate within the body of the caterpillar without spinning any cocoons. These last two groups contain the large majority of the most important parasites and are of immense value from the economical standpoint.



A Chalcid (*Chalcis mariae*)
[After Riley.]

This completes the list of two-winged and four-winged parasites which attack other insects in their pupal or growing stage. During the resting stage, however, insects are also preyed upon by certain enemies though not to so great an extent. All of these parasites are Chalcids with the possible exception of a few of the Ichneumons. Since both of these

have been discussed and there being no new items of special interest, we may pass to the consideration of the parasites of adult or mature insects.

While in the larval and pupal stage the insects are largely unprotected and fall easy prey to the designing parasites, thus is not the case with the adult insects. As a rule the mature insect is much more active and capable of self-protection. In addition to this the hairy covering of the body and the large wings of our moths and butterflies serve as complete protection, so that none of these are parasitized. In the case of the beetles the body is covered by shields or hard wing-covers which, with few exceptions, serve as efficient armor. The bees, wasps, and flies depend to a large extent upon their activity in avoiding their enemies. The grasshoppers and the true bugs or "stink-bugs" have the tough leathery overlapping which ward off all but a few of the more bold and persistent parasites. In spite of all these difficulties parasitism does occur to some extent during this stage, and, although the parasites are few in number, they are scattered through several different groups.

Among the flies parasitic upon adult insects we have only a few belonging to the Tachinid family which has already been described as composed of bristly flies with the bristles on the antennae smooth instead of feathery. The most notable example is the beautiful little fly that is parasitic on our common squash-bug. Some of the *Sarcophagidae* or flesh-flies are parasitic upon beetles and grasshoppers. When a grasshopper starts to fly one or more of these insects dart after it and, if successful, deposit eggs on the unprotected body between the wings. These hatch and the larvae penetrate the body of the host. Although these flies closely resemble both the house-fly and the Tachinids still they may be recognized by the somewhat bristly body, though not so bristly as the Tachinids, a peculiar checkered appearance which is usually present on the abdomen, and the antennal bristle which is feathered near the base but bare towards the end.



A *Sarcophagid* fly parasitic on grasshoppers.

The so called "Thick-headed Flies" or *Conopidae* do not resemble any of the two-winged insects already mentioned. As their name signifies, they have exceptionally wide heads, considerably wider than the body; the body without bristles and usually without hair; the abdomen club-shaped, i. e., narrowed at the base, sometimes quite wasp-like. These insects are parasitic upon adult bees and wasps. The egg is laid directly upon the host while in flight, and the young larva, when it hatches, burrows within the body of the insect taking up a position with its head towards the rear end of the host. The larva pupates within the host, when the adult emerges it escapes by eating its way out. The attack of these insects is not confined to the bees and wasps, but some are also parasitic on grasshoppers upon which they work in a very similar manner.

Of the four-winged insects only the Braconids are to any extent parasitic on adult insects. Often one of our little "lady-birds" or lady-bug" may be seen clinging to leaf, dead. On looking beneath the beetle there is seen a little silken cocoon of a Braconid which has issued from the body of the host in order to go into the resting stage. It will be remembered that when other members of this group attacked the larvae there were many parasites to each host, and they all spun cocoons on the back of host or within the body. Here, however, there is only one parasite to each host. Another example of these parasites attacking adult insects is the parasitism of plant-lice. Comstock says that it is very interesting to watch these little Braconids ovipositing in the bodies of plant-lice. When one has selected a plant-louse in which to oviposit she stands with her head towards it, and bending her abdomen under her thorax between her legs she darts her ovipositor forward into the body of the plant-louse. These parasites do not construct cocoons, but undergo their stages within the dry skins of the plant-lice. When the adult parasite emerges it cuts a circular lid in the back of the host. One side of the lid is left attached, and one may often find the skins of whole colonies of plant-lice with these little round holes in their backs.

There is still a small group of parasitic insects which has not been mentioned but which are very interesting from the fact that they are so entirely different from the forms which we have been considering. The males have four wings but the front pair are only slender, leathery, club-shaped appendages, while the hind pair are very large and fan-shaped. The females have no wings at all and greatly resemble a larva in form. They are parasitic upon bees and wasps and it is in the bodies of these insects that they pass their pupal stage. The name *Strepsiptera* is applied to this strange group of insects.

While the relation between parasite and host as it has been discussed is a simple one, it is by no means the whole story of parasitism. These primary parasites, feeding upon the tissues of their host, may in turn be parasitized by what are called secondary parasites. These secondary parasites may also be victimized by tertiary parasites and, in very rare

circumstances, there may be even quaternary parasites. This relationship is well illustrated by the parasites of the larvae of the the White-marked Tussock Moth which is very common on shade trees in our cities and towns. The caterpillar may be parasitized by *Amorphota orgyiae* which is one of the Ichneumons as is shown by its club-shaped abdomen and its sting-like ovipositor. The larva of this parasite lives within the caterpillar until the entire body has been devoured. The larva then leaves the skin of the caterpillar and spins an oval cocoon within which it enters the pupal stage. At this time one of the Chalcids (*Spilochalcis debilis*) which, it will be remembered, have elbowed antennae and heavy hind legs, comes along and "stings" the cocoon laying an egg in the body of the Ichneumon pupa. When the food supply is exhausted, the larva spins its cocoon within the other cocoon. *Dibrachys boucheanus*, another one of the Chalcids now lays an egg within these cocoons. This insect pupates without spinning a cocoon. The pupa of this parasite fall a prey to a little Chalcid called *Asecodes albitarsis*. Hence the leaves, used by the caterpillar to build up its own body, were successively transformed into four other insects, for none of these parasites partook of any food save that which was in the original caterpillar.

The importance of the part played by parasites in controlling the increase of injurious insects may be made more clear by a discussion of some of our common pests. In 1895 the White-marked Tussock Moth, already mentioned, threatened to become a plague in Washington, D. C., during the latter part of August and the early part of September almost every poplar, soft maple, box elder, elm, elder, birch, and willow in the city was completely defoliated, while other trees were badly damaged. Somewhat later in the fall Dr. Howard, U. S. Entomologist, found that about 90% of the caterpillars were parasitized. Nevertheless, the 10% which survived produced enough so that next spring there were large numbers of the caterpillars. At this time Dr. Howard gathered 624 cocoons. From these only 12 moths emerged while there were 916 parasites of which only 64 were primary. In other words parasites destroyed 98% of the larvae. A month later it was almost impossible to find any larvae when the year before at the same time there had been thousands.

In handling the Cotton-boll Weevil of the South parasites are made to play a very important part. There are a number of weevils closely related to the Cotton-boll Weevil but which never bother the cotton. They live in the grass and weeds about the cotton fields, and are parasitized to a great extent. At the time when these parasites have emerged and before they have again laid their eggs, the weeds and grass containing the weevils are destroyed. The female parasites, as a second choice, then hunt up the Cotton-boll Weevils and parasitize them, greatly lessening the damage done by that insect.

In many localities the main factor which keeps the Hessian fly check is the presence of parasites. When climatic conditions are favorable the Hessian fly may become so numerous as to do much damage,

but the parasites, of which there are a number of different kinds, increase much more rapidly so that before the season is over 90% or more of the "flies" may be destroyed so that the following year there are but few to produce a new generation.

Although these and countless other injurious insects are held in check in their native home by their individual parasites, for, as a rule, each parasite has its particular host and will attack no other unless it be a closely related form, we sometimes have an insect, which in its own country was never considered dangerous, brought into a new country, leaving its parasitic enemies behind. Supposing a single egg-cluster containing 200 eggs of a moth be shipped into this country on nursery stock. In the first year 100 of these would develop into females which would lay 200 eggs apiece. The second year there would be 20,000 moths or 10,000 females. The third year there would be 1,000,000 females. The fourth year, 100,000,000, while in the fifth year there would be 20,000,000,000 caterpillars, or a serious plague. This is not entirely theory. The Eastern states are now coping with this very circumstance. Last year, according to the report of the U. S. Bureau of Entomology, over one million dollars of private and public funds were expended in fighting the Brown-tail and Gypsy Moth. Whole tracts of land have been rendered almost uninhabitable by hordes of these insects. Although artificial methods have been employed and proven of great value still they have not been able to keep up with the increase of the insects. Leading Entomologists recognize that they must depend largely upon parasites, and consequently parasitized caterpillars from the native European home of the moths are being shipped in by the wagon loads in the hopes of getting some of the parasites established. Every precaution is taken to prevent secondary parasites from escaping and destroying the beneficial parasites. It was due to the great care which our nurserymen constantly exercise with the aid of Professor Bruner that the Brown-tail Moth is not started in our State. This spring winter-webs containing live caterpillars were found on nursery stock shipped here from France, the home of the Brown-tail.

While the parasites may do much, and Entomologists may do much, Entomologists, parasites, Agriculturists, and Horticulturists must all combine forces as friends in order to successfully combat our insect enemies.

PHENOLOGY OF FOREST TREES AT LINCOLN, NEBRASKA.

R. D. Garver, Forestry Student.

The weather conditions during the spring of 1909 were decidedly abnormal and resulted in a retarding of forest growth for a considerable period of time. During the month of March the normal temperature is 36° F., but in 1909 this month showed a total of 18° F., above normal which would give a daily average of thirty-six and eighteen thirty-firsts of a degree. The first week was characterized by an unusually high temperature and the rest of the month by a temperature which ranged a trifle below normal except for an occasional warm day. The precipitation was .95 of an inch of which .41 was snow. The weather was cloudy about two-thirds of the time, the only clear day occurring in the first part of the month. The prevailing direction of the wind was from the northwest and attained an average velocity of 11.3 miles per hour, which is a little below the average for this month.

The month of April shows the greatest divergence from the normal trend of the weather. This month shows a total decrease of 132° below normal, the normal temperature being 50.6°. The weather throughout the month was unsettled and alternated between 22° below normal and 8° above, but the larger part of the time it was below. The average temperature was 4.4° below normal for each day. The precipitation equalling 1.08 inches was a little below the average even though there were very few clear days and quite an amount of cloudy, misty weather. The prevailing direction of the wind was from the north and the average hourly velocity was 14.3 miles.

In May there was somewhat similar weather but it was not so pronounced. The month shows a total deficiency of 78° F. below normal, the normal temperature being 62.9°. The first few days of the month were unusually cold, the temperature alternating below and above normal until the middle of the month, and from then on the temperature was below normal, except three days which gave an average temperature of 2° above normal. The average temperature for the month was two and sixteen thirty-firsts degrees below normal. The rainfall amounted to 5.63 inches which is a little above the average. The prevailing direction was from the southeast with an average velocity of 11.5 miles per hour. The weather was very cloudy and there occurred only five clear days.

The following is a list of the trees noticed and the dates of their phenology:

Boxelder (*acer negundo*)

April 13, small leaves

Cottonwood (*populus sargentii*)

April 15, buds swelling

Elm (*ulmus americana*)

April 15, buds opening

April 18, fruit forming

April 28, leaves out

Maple (*acer saccharinum*)

April 15, buds opening

April 26, small leaves

Mulberry (*morus alba*)

April 15, buds opening

May 5, leaves out

Red-bud (*cercis canadensis*)

April 16, buds splitting

May 9, leaves out

Ash (*fraxinus lanceolata*)

April 17, flower buds opening

April 21, leaf buds opening

April 30, flower buds opened

May 2, leaves out

Horsechestnut (*aesculus hippocastanum*)

April 16, buds swollen

April 22, buds opened

Carolina Poplar (*populus augulata*)

April 18, buds swelling

Basswood (*tilia americana*)

April 17, buds swollen

Beech (*fagus atropunicea*)

April 18, buds opening

Norway Maple (*acer platanoides*)

April 17, buds opening

Walnut (*juglans nigra*)

April 21, buds just swelling

April 30 buds open

April 30, leaves out

Russian Olive (*eleagnus augustifolia*)

April 22, buds opened

May 10, leaves out

Locust (*gleditsea iriaconthas*)

April 30, buds opening

Kentucky Coffeetree (*gymnocladus dioica*)

April 30, buds opening

May 12, leaves out

Hackberry (*celtis occidentalis*)

May 5, buds opening

May 10, small leaves

Ailanthus (*ailanthus glandulosa*)

May 9, buds just open

Catalpa (*catalpa speciosa*)

May 13, buds opening

Willow (*salix nigra*)

May 13, leaves out

The spring of 1909 was decidedly backward in seasonal growth but the weather was not severe enough to cause a marked freezing back. A few of the trees that normally develop early had their buds start in March, but the subsequent weather was just cold enough to retard the growth already made and not sever enough to kill this slight growth. Later when warm weather did come most of the species made an exceptionally rapid development and there seemed to be less variation between the different species, than is the case in a normal season.

FOREST NURSERY PRACTICE.

Frank J. Phillips.

Since the year 1902, the U. S. Forest Service has followed the practice of establishing forest nurseries as rapidly as warrantable on various National Forests, where forest planting is an important project. At the end of last year, there were twenty-four such nurseries which were estimated to have an annual capacity of approximately 9,000,000 seedlings. The largest nursery, of about ten acres, is located at Halsey, Nebraska, while the remaining nurseries are widely scattered throughout the west and are for the most part of comparatively small area.

During the month of January, 1907, the Forest Service deemed it advisable to hold a conference of the men in charge of various nurseries then established. The principle nurseries at that time were located in Nebraska, New Mexico, Colorado, Utah and California. The basis for the following material was deduced from this planting conference but is supplemented largely by the writer's experience at government and private nurseries.

It should be borne in mind that nursery methods at the various stations have been widely different because they are located on widely variable sites. Results from one nursery are often only of general value in comparison with those from another and scarcely at all comparable with the practice at most commercial nurseries. The sites of the government nurseries vary from the hot sand hills of Nebraska to the cold mountain valleys of Utah and Colorado and to the warm valleys of California and New Mexico, in localities where forest nurseries have never before been established. The soils vary from gravel at the nursery in Utah through sandy loam at Halsey, Nebraska, and fine loam in Colorado and California, to an adobe soil in New Mexico. Many of the trees that are being propagated have never been grown extensively before.

All nurseries with the exception of the one at Halsey, Nebraska, are designed largely to supply coniferous tree stock for planting on water-charge of men who have been in the work for several years and who hold the rank of forest planting assistant or some superior rank. The one at Halsey provides material for the aforesaid station of the sand-hill region of Nebraska. At each of the stations, the primary design is to raise high class nursery stock suitable for planting in the immediate region at a price cheaper than that quoted by commercial nurseries. The location of these stations in the center of large planting areas is especially advisable for the following reasons:

1. Such stock is usually better adapted to local conditions than introduced stock.

2. Most of the stock has been much superior in grade to that which can be bought in the open market.

3. Ease of getting stock to planting areas especially where the climate is variable during the planting season or where there are only short favorable periods.

4. Uniform supply of desirable species.

5. Increased local revenue and local interest in the success of the work.

6. Ease of exact experimentation in nursery and field planting.

At most of the nurseries, there is considerable experimentation, usually in limited areas since most of the nursery area is devoted to raising stock according to what is considered the best method for a given species and given site conditions. Practically all nurseries are under the

Table No. 1.

FOREST NURSERIES OF THE FOREST SERVICE TO YEAR 1906.

Name of Nursery	Location	Approximate	
		Area— (Acres)	Output— (Seedlings)
Henninger's Flat Station	San Gabriel Forest, Calif. (Now the Angeles)	1.02	387,000
Halsey Station	Halsey, Neb.	5.50	3,000,000
Clyde and Bear Creek Station	Pike's Peak Forest, Colorado.	0.50	410,000
San Marcos Station	Santa Barbara Forest, Calif.	5,760 sq. ft. .13	181,000
Fort Bayard Station	Gila Forest, New Mexico.	1.9	385,000
Wasatch Station	Salt Lake Forest, Utah (Now the Wasatch)	4.0	Established spring of 1906. No returns for this year.
		13.65	4,363,000

Table No. 2.
FOREST NURSERIES—1910.

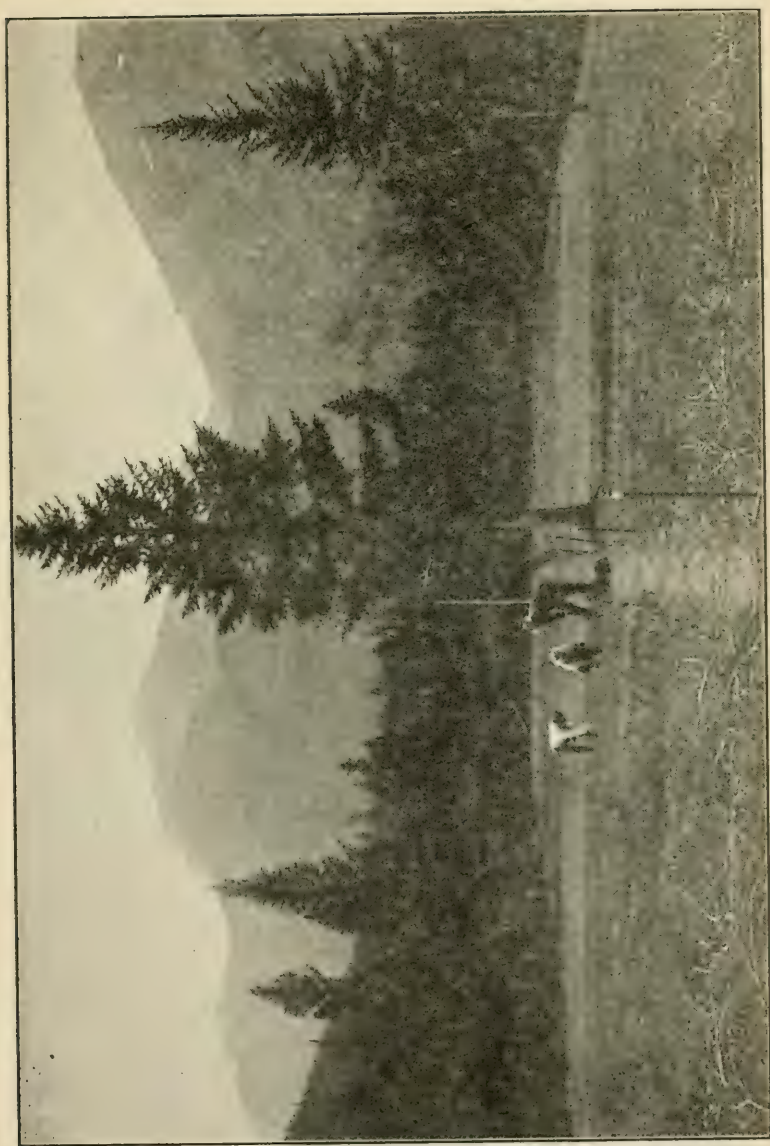
Name of Nursery	Location	Area	Seedlings on Hand	Trans- plants
DISTRICT I				
Trapper Creek	Bitterroot Forest	1,350 s. ft	24,000	
St. Regis	Lolo Forest	3,420 s. ft	115,914	
Savenac	Lolo Forest	7,144 s. ft	1,528,000	6,200
Boulder	Helena Forest	7,876 s. ft	2,465,050	
		.45 acres		
DISTRICT II		Acres		Ready to Plant
Garden City	Kansas Forest	1.3	300,000	75,900
Halsey	Nebraska Forest	1.4	500,000	213,860
Monument	Pike Forest	0.47	300,000	38,500
DISTRICT III				
Ft. Bayard	Gila Forest	3.8	500,000	102,000
Gallinas	Pecos Forest	1.1	240,000	51,000
DISTRICT IV				
Wasatch	Wasatch Forest	4.45	4,000,000	177,550
Pocatello	Pocatello Forest	4.625	1,000,000	10,000
Upper Joe	Manti Forest	.02	100,000
DISTRICT V*				
Lytle Creek	Angeles Forest	5.00	500,000	65,000
Los Preitos	Santa Barbara Forest	10.00	200,000	124,000
Raugh Nurseries	Cleveland Forest	1.5	25,000	15,000
Cerro Alto	San Luis Forest	.5	1,000,000	10,000

Only one nursery in District 6, established in the spring of 1909, and from which no returns have as yet come in.

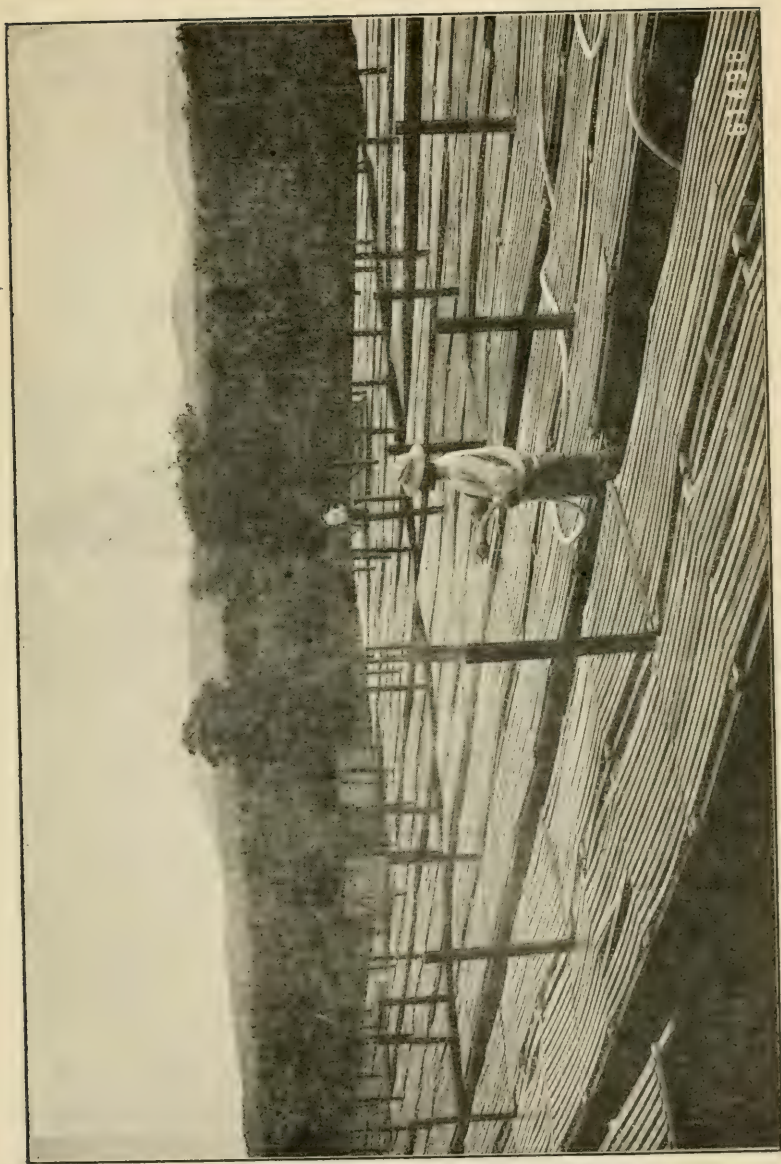
*Figures on District 5 are for 1909.

Method of Shading.

In the establishment of these planting stations, it was generally assumed that at least some artificial shading was necessary. The two general systems, high shade frames and low shade frames, have been tried with varying degrees of success. Where shading is necessary for the entire growing season with little variation of light and heat, the high shade frame may be advisable. It has been held that such conditions obtain throughout certain portions of the southwest. Where there is considerable variation in weather conditions, with necessity for alternate shading and freedom from shade, low shade frames are considered best. Such frames are especially suitable where alternate humid



Open Seedbeds with Hydrants Along Main Path Wasatch Nursery, Salt Lake National Forest, Utah.



Shade Frames Eighteen Inches Above Ground $3\frac{1}{2}$ feet wide, 12 to 14 feet long. Watering by spray over frames, Fort Beyard, New Mexico.

and dry conditions follow closely after each other and it is thought that this system may have some value in controlling damping-off. At most of the nurseries half shade is provided and there is a tendency to use such shade during the first season only. Bull pine (*pinus ponderosa*) has been grown at the Wasatch nursery without shade with good results and there is a possibility that northern nurseries may be able to produce better seedlings of certain species without shade than with it. In either kind of shade frame the lath should extend from north to south rather than from east to west since a continual change of shade is secured.

If high shade frames are to be used large posts are necessary. Such posts should extend at least seven feet above ground in order to allow a man to work while standing erect without striking connecting two by fours. It is generally considered that these posts should be set in rows 8 to 12 feet apart each way and wherever possible such posts should be treated with preservative to lengthen their life. This is needed because of the large amount of artificial watering which is often necessary in forest nurseries and which tends to rot posts more rapidly than would otherwise be the case. Creosote paint, tar, charring, and charring with tar applied afterward have been used. Usually two by four stringers are used to connect the tops of the posts from north to south. Similar stringers may be run at right angles but are not usually considered of sufficient advantage to pay for the increased cost. Wires are used in place of the two by fours by some nurserymen being run at both right angles and diagonally in order to give sufficient strength.

Overhead shading may be provided by machine woven lath. Building lath are connected by five double strands of woven wire and are spaced according to the amount of shading desired. In southern California a lath house was constructed in which the lath were nailed to two by fours and other smaller stringers overhead and on the exposed sides of the nurseries. The cost of the high shade frame system varies from \$800 to \$1500 per acre according to local conditions. The woven lath may be purchased at 40 to 80 cents per running yard according to closeness of bids and freight rates. Stripes of woven lath 180 to 200 feet long may be stretched by the use of a windlass or a block and tackle. The disadvantages of the system consist of the high cost, impossibility of carrying light and heat conditions, and the necessity of covering paths as well as beds.

Small aspen poles have been used in place of lath in the high shade frame system in Colorado and brush is likewise used by some of the commercial nurseries. Peeled poles are desired as the falling bark interferes with the beds. This system furnishes irregular shade and may be built much cheaper than when lath is used.

Low shade frames, 12 to 24 inches above the seed beds, are usually constructed from lath and stringers smaller than two by fours. If these materials are not at hand in mountain regions one can frequently induce a sawmill man to saw to order whatever may be needed. It is usually

claimed that the low system is cheaper than the high system but in many cases the cost is fully as great.

There is a great variety in the styles of low shade frames. In most nurseries the width of the screens is four feet with a length of 8 to 12 feet. However, the following sized screens are in use at large nurseries:

3 feet by 4 feet, handled by one man.

4 feet by 4 feet, handled by one man.

4 feet by 12 feet, made from woven fencing handled by two men.

4 feet by 16 feet, handled by two men.

4 feet by length of beds, made from woven lath which is rolled from one end to the other.

Where there are strong winds or the screens are made of very light material, it is usually customary to fasten the screens with hinges, hooks and eyes. Nearly every nursery has some variation in using this system. Some men leave spaces between two or more beds where the screens may be stacked; others leave open space at the ends of beds; others prefer woven lath which may be rolled to the ends of long beds; still others prefer to set posts beside each bed to which the screens may be fastened. In windy regions, where it is desired to remove the entire shade frame, hooks and eyes should be used in place of hinges. Posts may be arranged so as to hold the screens from two beds.

Soil Preparation.

In many cases, the original nursery site was covered with native sod and underbrush. Sod land is preferred since underbrush land demands expensive clearing. Both types of land are usually free from noxious weeds. Occasionally, long cultivated areas are secured and such sites are usually in demand because of the soil uniformity, physically and chemically and because nursery operations may be started immediately.

Deep, thorough stirring of the soil, somewhat similar to that in market gardening practice, is necessary. This can be done by spading or plowing but the latter is usually preferred because of cheapness. Occasionally, plowing has been followed by spading where heavy soils are used. If high shade frames are used, plowing may be done except where posts interfere and the remaining area may then be spaded. Through pulverizing and leveling are essential to proper distribution of soil moisture, evenness in seed sowing and proper root development. Loose soils may require some packing while heavy soils should be as free from packing as possible.

***Seedbed Preparation.**

Since nurseries are located on valuable soils, it is well to have as small a proportion of the area in paths as possible and still not interfere with work in the seed-beds. It is also considered advisable to allow a broader path in open or low shade frames nurseries than in high shade frame nurseries. Even when paths are as small as possible, they will still occupy ten to fifteen per cent of the area. A center path, running

lengthwise of acre plats, even under a lath house, should have a breadth of at least two feet. Paths between beds should be from fifteen to eighteen inches broad. On an acre plot which is twice as long as it is broad (195.16 feet by 147.158 feet) in which a two foot path runs lengthwise through the center and in which beds six and one-half feet broad are separated by eighteen inch paths, there will be 19.65% of the area in paths. This does not allow any border paths and limits beds at one end to five feet in breadth.

At many commercial nurseries, the beds are only four feet broad and eight feet long with paths averaging eighteen inches broad. Occasionally beds are narrower than this and the paths considerable broader. Many of these nurseries are located on soil valued at \$200 to \$300 per acre but the nurseryman believes that the small sized bed with fair sized paths allows a sufficient saving in labor to compensate for the loss in productive capacity.

*No description is given of the methods of seedbed preparation or seed sowing in use by commercial nurseries for deciduous tree stock.

Ordinarily, paths should not have a depth greater than two to three inches. This is usually accomplished by packing the soil under foot while the men are working in the nursery. Where the paths are deeper than this, the sides of the beds are likely to be very irregular and cause a loss in growing space. There is also considerable danger of drying out along the edge of the beds causing the seedlings which border deep paths to be weak or stunted because of the increased exposure. When nurseries are established on slight or moderate slopes, the beds are leveled and boards are placed along the lower sides to prevent washing. Such boards are also used in some nurseries on level land.

In cases where flooding occurs during the rainy season, as it does in southern California, it was the practice to use the paths to carry off the water. In such cases, the paths were sometimes rapidly eroded but were filled in again by laborers as soon as the severe rains were over. It is doubtful if this is good practice and it would seem that some special drainage arrangement would be better.

Seed Testing.

At all nurseries, the variable results obtained from forest tree seeds, which were collected from different sources, during different seasons, of various ages, and various methods of storing, showed the need of extensive germination tests. Such tests are necessary to secure good results in seed sowing and should also furnish a criterion in the selection of regions, sites and individual trees from which seed should be collected. The various methods of seed testing which have been used are as follows:

1. Color test; good seeds are usually brighter colored than poor seed.
2. Frying pan test; good seeds pop open in a hot frying pan while poor seeds char.
3. Jack-knife test; good seeds fill the seed coats, weak seeds partial-

ly fill the seed coats and dead seeds are empty or nearly so. Poor seeds are frequently discolored on the interior.

4. Water test; weak seeds and dead seeds float while good seeds sink.
5. Blotter test; actual germination between blotters.
6. Moist chamber test; actual germination in moist chambers.
7. Sawdust test; actual germination in moist sawdust.
8. Soil test:
 - a. In greenhouse—actual germination.
 - b. In nursery beds—actual germination.

At present, the Forest Service is testing forest tree seed on a large scale and good results are already being secured.

Seed Sowing.

This subject has been considered in many works on forestry and while general results apply very well, there can be little doubt that for many species, variation will be necessary to a striking degree. It is also apparent that considerable experimentation will be necessary for many of our species which have not been extensively grown and concerning which there is meagre information.

In most of the Forest Service nurseries, the system of drill or row planting prevails. However, there is still considerable discussion concerning the relative merits of broadcasting, sowing in drills lengthwise of the bed, and sowing in drills crosswise of the bed. Each system has strong merits and will be followed according to local requirements.

It should be easy to determine what system of drill seeding is to be preferred, since the principle is practically the same. Crosswise rows are more easily cultivated and more easily weeded than lengthwise rows but the latter are sown much more quickly and require slightly more time in weeding and cultivation. At Halsey, Nebraska, root pruning is much more easily accomplished in long rows than in crosswise rows. On the whole, results seem to favor the long row as the cheaper method of producing seedlings, since it saves time in spring and early summer when time is most valuable. Bull pine (*pinus ponderosa*) may be sown in lengthwise rows at five to ten cents per pound while crosswise rows would cost three or more times as much.

For seed drills, the planet, Jr and the Iron Age are especially valuable. The first mentioned is usually preferred for conifers since it sows more evenly and ordinarily gives better results with unclean seed. The Iron Age is sometimes preferred for deciduous tree seed. This difference in use is largely due to a metal device for controlling seed flow in the Planet, Jr and a brush device in the Iron Age. It is held, however, that the unsatisfactory results with the Iron Age machine are often due to a lack of care rather than to the defects of the machine. Both of these machines give the best results with coniferous seed of moderate size, such as those of Bull pine (*pinus ponderosa*), Scotch pine (*pinus sylvestris*), Jeffrey pine, (*pinus jeffreyi*) and white pine (*pinus strobus*). Smaller

seeds may be sown by boring special holes in the disc that regulates seed flow. Large seeds such as that of Coulter pine (*pinus coulteri*), sugar pine (*pinus lambertiana*) and others are best sowed by hand and this is often the case with very small seeds.

Machine planting is usually lengthwise of the bed but may be used crosswise. In using the seed drill, the work should be done by a careful man who will not only cover ground rapidly but will also sow to even depths and be certain of seed flow. Many men never become sufficiently expert at this work to secure the best results. Machine sowing it to be especially recommended because of cheapness, even sowing and the ease with which the work may be done on windy days. In gravelly soils, it may sometimes be advisable to sow the seed by machine and cover by hand. In fine soils, where small seeds are used, there is sometimes a tendency to sow the seed too deeply. As previously mentioned, where root pruning is desired, the lengthwise rows are to be preferred.

Row sowing by hand may be performed in various ways. A common method of making a trench is to nail triangular strips six inches apart to an inch board which is as long as the beds are wide. These triangular strips form the trenches and the depth of the trench may be regulated by the amount of pressure applied to the board or by having boards with different sized strips. Markers are usually attached to the end of the board to keep a uniform spacing. Most frequently the seeds are sown directly from the hand but this usually causes unevenness with even the most careful sowers. Often the seeds are sown from a bottle over which one finger is placed to control the rapidity of seed flow. Occasionally a V shaped trough is used which has a slit at the bottom. The seed are scattered against the side of this trough at an angle to secure greater evenness in sowing. Hand sowing is always difficult on windy days.

Broadcasting has given some good results and may become a common method for certain species. Experience in California with knobcone pine (*pinus attenuata*) has shown that damping off is less serious with broadcasted beds than with rows beds. No explanation has been given for this peculiarity. It has been thought that it might be due to a more complete isolation of each seedling in the broadcasted beds but in 1904 the densely broadcasted beds of *pinus attenuata* did not damp off while sparse stands of drill seedlings in an adjoining bed were affected. It is also possible to secure much denser stands of seedlings by broadcasting than by any other method and usually this is as cheap or cheaper than sowing by hand drills. The cost varies from 10 to 60 cents per pound according to the size of the seed and the skill of the sower. It is sometimes held that broadcasting requires little or no skill but experience has shown, that in order to get an even stand, the sower must have considerable experience or must sow very slowly. There is occasionally a tendency to use less care in preparing the seedbed for this method but this is usually due to inexperienced workers.

It is thought that in many cases that seed sowing has been too light. With species having 80 to 90 per cent of strong, vital seed a good rough

rule is to sow at least twice as many seed as the contemplated number of seedlings at the end of the first year. When the broadcast method is used 150 to 300 seedlings per square foot at the end of the first year is considered a good density while 80 to 120 seedlings per square foot is considered a good stand when the drills are six inches apart. It is recognized that the stand is going to vary with the species, method of sowing, site, and length of time the seedlings are to remain in the nursery bed. While 500 seedlings to the square foot may be possible with white pine (*pinus strobus*) in New York State it is not the best density for Bull pine (*pinus ponderosa*) in Nebraska. Where seedlings are to remain in the seedbed only one year seed must be sown thicker than where they are to remain two years unless there is danger of considerable loss the second year. Thus when jack pine (*pinus divaricata*) are to be transplanted at end of the first year it is not uncommon to have 80 to the linear foot while 50 to 60 would be a dense stand of two year old seedlings.

Special treatment of coniferous seed with red lead is usually necessary to prevent their being eaten by birds. The easiest method of treatment is to moisten a bucketful of seed and then stir in red lead. The film of moisture will cause the red lead to stick to the seed and only a few minutes stirring is required to get an even coating. This process usually does not cost more than two cents per pound as one pound of the red lead will treat from 5 to 8 bushels of seed and the red lead has been known to remain on the planted seed for a year. Moistening coniferous seed or stratifying it in moist sand for a few days decreases the time necessary for germination after planting and it may increase the per cent that will germinate.

Weeding.

It is not often that more than 3 or 4 weedings are necessary in any season. New ground usually requires more weeding than that which has been in the nursery for a considerable length of time, and the first two weedings are much worse than the third and fourth weedings. Weeding is usually limited by thorough cultivation but even with the best of cultivation some weeding will be necessary.

Watering.

Watering varies largely with site and season. At Halsey, Nebraska, it was customary for years to water the seedlings by spray from hose. This was a tedious process and in a climate where evaporation is rapid it often happened that watering throughout the late afternoon and up to late at night was not adequate during the driest and hottest periods. During the last three years the system has been changed to surface irrigation with good results in lessening the cost of labor and in securing adequate watering. The system of surface irrigation for forest nurseries was first suggested by the writer for ranger nurseries in New Mexico where the soil was heavy and the ranger's time was occupied by many other duties. It was later experimented with in the large nurseries under the direction of Mr. L. C. Miller and has been greatly improved by him.

At the Fort Bayard nursery where low shade frames were used it was customary to water by throwing a spray over the frames and to allow the water to drip from the frames onto the seedbed. This system is opened to serious objection because of the amount of water lost in evaporation, unless it is performed at night, and because the method is slow. In California 100 foot hose was used with two sprinklers which threw a revolving spray. This saves labor and the water was distributed even enough on the porous soil to be entirely satisfactory.

Different soils require modifications in the system of watering. For instance the adobe soil at the Fort Bayard nursery absorbs water slowly and washes readily when it becomes saturated. At the Watsatch nursery where gravel soil prevails or at Halsey where there is sandy loam large amount of water may be applied in a short period of time.

It has not yet been fully determined whether heavy watering at moderate intervals is superior to light waterings at very frequent intervals. Most nurserymen are inclined toward the former view and recent work on the control of damping off seems to be in favor of this method.

At Halsey, where irrigation is performed, a gasoline engine is used. In the Watsatch nursery, water is secured from a spring and held in a storage tank until warm enough to apply to the seedlings. Windmills and hydraulic rams with storage tanks may also be used to advantage where local conditions are favorable.

It should be remembered that a very light watering followed by hot weather may cause an increase of evaporation over what might have occurred had there been no watering. Evaporation is less at night and it would seem that in nurseries where artificial watering by hose is necessary that it would be best to water late in the afternoon and early in the evening. In moderately humid climates it may be possible to use light watering with success.

Watering in the north during the growing season should be stopped usually by the middle of August or the first of September. In southern California the practice has been to water from the first of June to the middle of September or the first of October. Watering was always done in the morning since it was thought that conditions were less favorable to damping off if the trees were watered at that time rather than in the evening. At Fort Bayard it is customary to do most of the watering in April, May and June with some watering in September and the first part of October. Since a large part of the damage ascribed to winter killing is due to drying out it may be advisable to water from one to three times during the winter.

Cultivation.

Cultivation varies to a wide degree under different conditions. On a heavy soil which has a tendency to pack it is often necessary to use a board about 6 inches broad and as long as the bed is wide through which shingle nails have been driven in order to assist the seedlings in breaking through the surface. The nails should be about one-half inch

apart each way and should project through the board from one-third to one-half an inch. By placing the board on the bed the surface of the soil is readily broken without disturbing the shallow planted seed. In Colorado this board also served the purpose of cultivation after the seedlings broke through the ground and is considered a rapid, satisfactory method for heavy loam soil.

After the seedlings are up it is customary to use a specially constructed rake which is made by using nails for teeth and has a breadth not quite equal to the distance between drills. In some cases garden rakes have been used by raknig rght over hte seedlings. Such practice usually causes more loss than is occasioned by using the home-made rakes but is much more rapid and where labor is scarce may be used to some advantage.

In broadcasted beds the stand of seedlings is usually dense enough to limit the growth of weeds and to protect the soil well enough so that only limited cultivation is necessary. Often broadcasted beds are not given any cultivation.

Cultivation should always follow each rain or artificial watering unless it is a region where there is a pronounced rainy season, when cultivation should be given as soon as the ground is sufficiently dry. Shallow, frequent cultivation is to be greatly preferred over deep, infrequent cultivation. Cultivation on the heavy soils such as is found at Fort Bayard must be much more frequent than is required on the sandy soil at Halsey or the gravel soil at the Wasatch. Naturally, more cultivation is needed in New Mexico and Southern California than in the north because of the low humidity of the air and the rapid evaporation of moisture from the soil.

At most of the government nurseries, it is customary to cultivate every 7 to 10 days, although at Halsey 3 to 5 cultivations during the season have been considered sufficient. At Halsey it has been the practice to cease cultivation from the first to the middle of August to allow the seedlings to "harden up" before winter. Weeds continue to grow after this but assist in hardening the seedlings and do not make sufficeint growth to form seeds.

Mulching.

Mulching is usually used to protect seed during the germination period, to protect seedlings from frost effect, to retain moisture in the soil and occasionally to retard growth in spring. The best mulches are tree leaves, sphagnum or other mosses, straw or hay. The ideal mulch is one free from seeds which are likely to be introduced into the nursery. It should also fit closely enough ot protect the seedlings and yet allow aeration. Most commercial nurseryman prefer leaves because of their advantage in the above respects and because they are cheap and have a remarkably high fertilizer value.

During the germination period, mulching has a tendency to hold the soil at a uniform temperature, to retain soil moisture and to prevent the baking of the top layer. The practice is an excellent one but since germi-

tion is variable, many seedlings are of considerable height before the last seeds germinate. If the mulch remains too long many seedlings are weakened and at times a considerable number are lost by being pulled when the mulch is removed. Ordinarily, the nurseryman must remove the mulch before the tardiest seed have germinated.

Mulch is especially valuable in protecting seedlings from heaving during winter and from drying out. As a soil cover it prevents as serious freezing as would occur without it and especially assists in controlling the alternate thawing and freezing that is so likely to cause heaving. Mulch retards the growth in spring, for a period of 7 to 10 days, but the seedlings are usually bleached to a slight extent. Many hay mulches and possibly other mulches are thought to increase the loss from damping-off.

In Colorado it was found that mulched seeds outside shade frames germinate one to two days earlier than unmulched seed planted under shade frames giving one-half shade. Mulching to uniform germination is advised for very small seeds and for heeling in larger quantities. It is thought that mulching immediately after transplanting may have some value in reducing loss. Leaf mulch is usually applied to a depth of two inches, and is placed by hand, while straw is often applied to a depth of four inches.

Damping Off.

Damping off has been especially bad on jack pine (*pinus divaricata*) in the nursery at Halsey but has also caused considerable damage with other species and in other nurseries. It has not been infrequent to see whole beds in which 90 per cent of the stand has been lost from this injury. Spraying with Bordeaux mixture, variations in watering, fertilizers and soil covers have been tried without many conclusive results. Since last year a forest pathologist has had charge of the experimentation at Halsey and it is to be hoped that some satisfactory method of combatting this injury may be devised. In Germany "schutte" has been largely limited by the use of leguminous fertilizers. Numerous investigators have recommended experiments in various degrees of light, degrees of air moisture, degrees of soil moisture; fertilizers such as the legumes, commercial fertilizer leaf mould, animal manures and ashes; and fungicides applied as sprays. Since germination is variable, many seedlings are of considerable height before the could be accomplished without deterioration in other respects it would be preferable to a method dealing only with the seedling. It is probable that there are several fungi which cause the damping off in which case two or more remedies may be necessary in the same nursery.

At Halsey, it was found that gravel spread over the bed after the seeds were sown exerted a marked control. In beds where natural soil, sand and gravel were used as surface layers the greatest damage occurred in gravel. This was due to the gravel preventing an incrustation of soil about the base of the seedling after rains or watering. However, the remedy was not considered a good one because of the deterioration of

soil that would result in applying gravel. It was also found at Halsey that the disease was worse on ground newly broken than on areas that had been in seed beds for some time.

Other Injuries.

Red ants may cause damage especially to the seed. In field work a good remedy is to keep wet crystals of potassium cyanide at the opening and the ants burrow. In greenhouse experiments at the University of Nebraska, ants have caused serious damage but were effectively dealt with by using sulfur and salt at one time and carbon bi-sulfide at another. Insect powder (Pyrethrum has been used in some greenhouse work and has been effective.

Rodents, such as ground gophers, rabbits, mice and chipmunks occasionally cause damage. The ground gophers often follow the rows shortly after seeds are planted and cause considerable loss. Trapping is the best method yet devised. Chipmunks are also bad after the seed is sown and may be killed by poisoned grain or shooting. Mice and rabbits are often worse during the winter of the second season or later and should be poisoned or shot. As many as 318 mice have been killed on one-half acre. Mr. J. M. Fetherolf devised a scheme of putting seed in a bucket of water which was so arranged that the mice could get into the bucket, and in this way succeeded in killing all mice in the nursery and around it. Rodents usually eat the largest seed species first and gradually work down to smaller seeds. They have not been reported as affecting Engelmann spruce (*picea engelmanni*) and balsam fir (*abies balsamea*). Chipmunks have been noted affecting limber pine (*pinus flexilis*) worse than any other species, even noted after treating with red lead. Birds sometimes pick at terminal buds. Red lead usually prevents seed injury, but not always, as turtle doves have been known to eat treated seed. Ehoooting may be necessary. Blue jays and magpies often pull up seedlings just as they come through the surface of the ground.

Fertility and Soil Composition.

Very few experiments have been performed in determining the value of physical and chemical soil factors as influencing the growth of seedlings and transplants and great work remains to be done along such lines. Commercial nurserymen follow a definite system of rotating seedlings with legumes and supplement the rotation by use of commercial and animal fertilizers. Uniform light loams of moderate fertility are recognized as producing compact, symmetrical and well developed root systems of higher grade than is produced on very heavy or very light soils. Loams underlaid by limestone are said to be especially valuable in developing a large proportion of trees with excellent root systems. However, this field of work remains almost totally undeveloped in this country and should be the field for exact experimentation in the near future. State experiment stations with foresters on their staff and the larger Forest Service nurseries are in a position to at least begin the work.

Root Pruning.

Root pruning has been practiced at Halsey to a considerable extent. The practice has been to place a U shaped blade on a Planet, Jr., seed drill so that the blade will cut from 6 to 8 inches beneath the surface. The machine is run by two men pulling and one pushing. This force could root prune two beds per days with trees set in cross drills and about 30,000 trees to the bed. There can be little doubt but that root pruned stock is far superior to unpruned stock so far as the root system is concerned but most authorities believe that the system as practiced is not as advantageous as transplanting. Root pruning is followed in many commercial nurseries by using a machine drawn by horses which slightly resembles a slush scraper but works underground. The form of the trees of the same age grown as seedlings in the open, seedlings under half shade, root pruned stock and transplant stock has been found to vary greatly and it is to be hoped that some system of root pruning can be devised that will be cheaper and fully as effective as transplanting. Root pruning gives the best comparative results with deep rooted species.

Transplanting.

Seedling stock is usually transplanted at the end of the first or second year of growth but sometimes at the end of the third season for slow growing species. Several methods have been used, of which the following are the most prominent:

1. Dibble method.
2. Furrow method.
2. Spade method of slit trenching with hand planting.
4. Spade method of furrowing with board planting.
5. Trencher method of slit trenching with board planting.

The dibble method is performed by using a dibble eight to ten inches long so as to give plenty of room for the root of the seedlings. The soil should be moist enough so that the dibble hole will retain its shape, and the seedling should be planted by pushing the roots of the seedling into the hole with the end of the dibble. The operation is completed by placing the dibble about two inches away from the planting hole and pressing the soil toward the first hole. This fills the first hole and makes a hole for the second seedling in the same operation. In light sandy loam, a man may plant at the rate of 600 to 1000 trees in ten hours of hard work.

The furrow method for bent roots consist of making a furrow and bending the roots rather than trimming any off. The trees are placed two inches apart and it is estimated that one man can transplant 3000 trees per day by this method but this seems to be an overestimate. The method is used by C. S. Harrison of York, Nebraska, and is described in a bulletin of the Nebraska Park and Forestry Association.

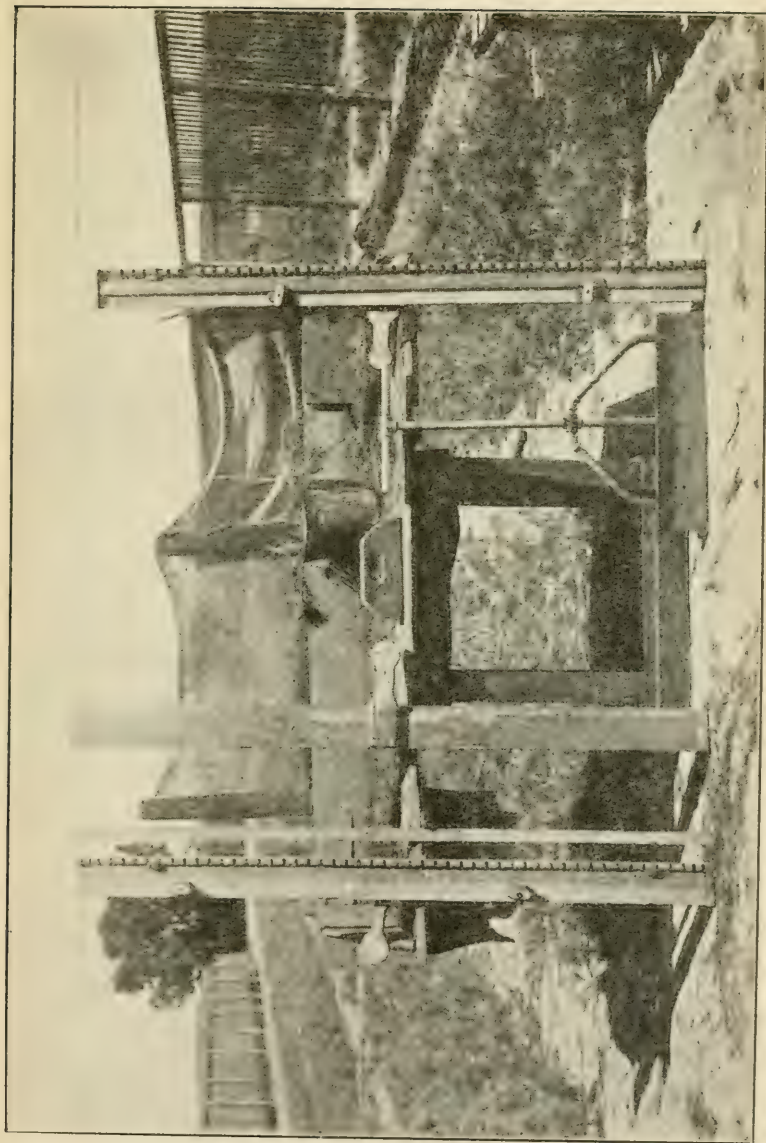
The spade method of making slit trenches and transplanting by hand is used occasionally in small nurseries and is an experiment in large nurseries. It is slower than the trencher method and not as satis-

factory, since the trees are not evenly placed and there is a tendency not to pack the soil sufficiently. In this method, the slits are made with a spade and the soil is placed around the tree by hand and by thorough watering. It is a sow method. The spade method of furrowing with board planting is similar to the trencher method with the exception that in one case the furrow is made with a spade and in the other the slit trench is made with a trencher.

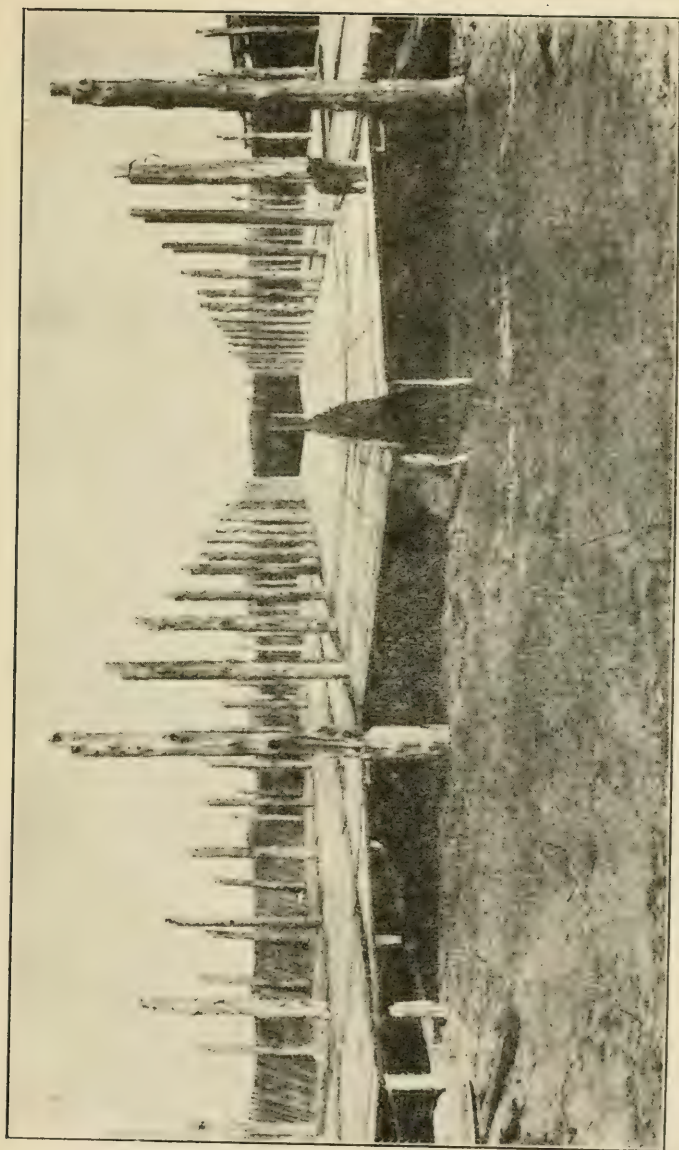
The trencher method of slit trenches with board planting owes its origin to the Fort Bayard Nursey but has been perfected largely at the Halsey nursery. The trencher is made from sheet iron and gas pipe and is usually forced into the soil by the operator, who stands on it and gradually forces it into the soil. The boards are 75 inches long and contain 50 notches. The seedlings are placed in the notches and are then held in place by putting a slat just above the notches. The slat is held in place in the trench, soil is crowded in on the side nearest the operator by the use of a small wooden tamper. The planting board is then laid flat on top of the trees and the soil on the other side is tamped, after which the board is removed and the trees are straightened. A special bench with a burlap windbreak makes the work of placing the trees in the board easy and at the same time protects the trees from the wind. Seven men work in the transplanting crew, four placing seedlings in planting boards at two benches, one making trenches, two men planting the trees and another man carrying boards to and from the benches. Generally the members of the crew change places four or five times during the day. The most skill is required by the men at the benches and the best workers are able to thread seedlings fully 80 to 100 per cent faster than average workers even after then have had considerable experience. This method of transplanting accomplishes three to eight times as much as the other trench methods. It is considerably faster than the dibble method. More trees can be planted per man than by the dibble method and it is not as tiresome for the men when they are working at full capacity. The trencher is not advisable for stony soil.

Transplants are usually planted without shade but some commercial nurseries use shade limitedly. The transplanting is as a rule performed in spring but some commercial nurseries transplant in autumn when labor is cheaper than in spring and when there is less rush in nursery operations. Transplant rows are from 16 to 18 inches apart and the seedlings are placed from one and one-half to three or more inches apart, depending somewhat on the size and the length of time they are to remain. Unless the soil is already quite moist it is good practice to water it quite freely after transplanting in order to save loss from drying out.

Nursery practice in the United States offers an excellent opportunity for a large amount of exact scientific work that should be of vast importance. In order to secure good results in government planting, it will be necessary to secure scientific men who will not only be practical but



Transplanting boards, trencher and table with burlap windbreak, Halsey, Nebraska.



Low shade frames at Halsey, Nebraska, sixteen foot sections which can be raised and fastened to posts.

will be able to perform experimental work greatly in advance of that already accomplished. The work at each government planting station should be put on a permanent basis by training men to the place by years of experience and so arranging the staff and policy that the organization and results will be of permanent value.

Private nursery practice can be greatly benefited by an improvement in the quality of the stock that is being sold and in a greater uniformity of prices. It is not infrequent to receive the same class of stock from two nurseries, not far apart, and to find a difference in price amounting to several hundred per cent. The variation in quality of material, described in different catalogs as the same class of stock is quite as variable as the prices, and when there is a combination of poor quality and high prices, the result is bound to be an injury to tree planting in general. In addition to the above, it should also be remembered that there are still interstate dealers who are willing to deal fraudulently.

It is to be hoped that steps will be taken to establish a closer relationship between the government and private nurseries and that some medium will be made available in technical form. No part of our forestry, with the exception of forest exploitation and forest utilization, has been practiced more than raising forest trees, yet little authentic information is to be had concerning nursery practice in different portions of this country. This is more than surprising when it is considered that nursery practice is the most intensive work that is done in forestry.

It is recognized that tree planting for a future timber supply must be based on the knowledge of the best workers and that we are in need of more exact information concerning the right kind of nursery stock and the methods of raising it.

LOCATING A FRUIT FARM.

C. B. Camp, Cheney.

Within the last half century there have been two elements entering into the life of the business world that may, with propriety, be called potent elements. One may be classed as advertising, the other as speculation. In combination these two elements were fundamental in attracting emigration to this vast western prairie country. A half century ago this vast area was a howling wilderness. Today it is transformed into a prosperous commonwealth of first magnitude. Advertising and speculation are potent factors of the every day life of the people even now, after the wilderness has been transformed into the pleasant surroundings of a thrifty enlightened people.

With the advance of opportunity, the elements of advertising and speculation become more and more demoralizing to the people. The individual seeking a location for a fruit farm should fully satisfy himself as to the real purport of the advertising articles, giving glowing word-pictures of the advantages offered to fruit growers in any special locality. The individual should first ascertain if the advertising is largely by a corporation or combination of interests to liquidate on property under speculation. If he finds the property is held by a combination of individuals he can safely make large allowances for over-drawn word-picture advertising. It is unnecessary to say that successful fruit growing in any locality pre-supposes a continuation of the business for a series of years. Therefore it would be a very profitable investment for the individual seeking a location for a fruit farm to take time and visit the several localities famous for the fine fruits they produce, before making his final purchase of a location.

The fruit districts of Michigan, New York, Ozark, Utah, Washington, Oregon and California all lay emphasis upon some special advantage possessed by their locality. An humble citizen of Lancaster county, Nebraska, having had thirty years experience in growing fruits in Lancaster county, desires to offer a word-picture to fruit growers everywhere of the real merits of the case. Suppose I was in possession of an exceedingly large compasses. Suppose I set one limb of the compasses at Lincoln, Nebraska, then open the compasses until the other limb reaches Chicago, Illinois, a distance of 630 miles. With this great compasses describe a circle. Traveling to the right we pass through Terre Haute, Indiana; thence to Cairo, Illinois; thence to Little Rock, Arkansas; then touching the southeastern corner of Indian Territory; then following up the Red River to the southwest corner of Oklahoma; entering Texas 100

miles south of the northern boundary of the state, we cross the northeast corner of New Mexico, and enter Colorado at San Jose, sixty miles west of the northeast corner of New Mexico; we then pass through Pueblo 30 miles west of Denver and enter Wyoming near Laramie. We leave the state at the northeast corner, crossing the northwest corner of South Dakota, and passing through Bismark, North Dakota; leaving the state at Grand Forks, we enter Minnesota at Crookston and leave the state at Duluth. We enter Wisconsin at Fond du Lac and pass out of the state at Milwaukee. The remaining of the perimeter of our circle will pass through Lake Michigan.

While students in school we learned that the radius of a circle was equal to one-half of the diameter. If one radii is 630 miles the diameter is 1,260 miles. This is the diameter of the great circle herein described. You will notice also only one of the famous fruit belts is located within the area of this circle. We learned while in school, to find the area of a circle, "square the diameter and multiply by 7854 ten thousandths, and the product will be in square units, of units of measure of the radii." Our vast home market, therefore, consists of 1,246,900 square miles of densely populated territory and containing only one especially advertised fruit district, and that being the Ozark country at the extreme southeastern extremity of a radii.

In order to comprehend the meaning of this home market let us notice the territory included within it. All of the state of Nebraska, all of Iowa, all of Illinois, all of Missouri, one-half of Arkansas, all of Indian Territory, all of Kansas, all of Oklahoma, one-half of Colorado, one-fourth of Wyoming, practically all of South Dakota, almost half of North Dakota, one-half of Minnesota and one-third of the state of Wisconsin. There are residing within this vast home market one-fourth of the population of the United States, some 20,000,000 people. Lincoln, Nebraska is fortunately situated at the exact center of this vast home market. Lancaster county is therefore most centrally located and can reach every part of this great home market with the minimum transportation charges, minimum of delay, quick returns, and less loss of fruit through neglect incident to long hauls all reduced to the minimum. The fruit grower near Lincoln in reaching the outer boundary of this great home market has a transportation charge of only 620 miles to any point. The fruit grower in the state of Washington, Oregon or California has a transportation charge for 2,000 miles to reach the center of this home market. The fruit growers of New York, Oregon, California and Washington have to consider the various items of expense, viz: high priced land, expensive fruit packages that will endure long shipment, delays in transit, fluctuating markets, indifferent commission salesmen at terminal points, and delays in the transmission of financial returns. All of these items are reduced to the minimum by the grower, situated near the center of population of this vast home market. One of the principal arguments used in favor of the various famed fruit districts, is the handsome appearance of the matured fruits. Granting their fruit appears a little more

perfect than Nebraska, Iowa, Kansas or Missouri fruits, will the slight difference in appearance more than offset the additional expenses incident to a two-thousand mile haul to market? The facts are, varieties adapted to Nebraska conditions and given care, produce fruits that are very satisfactory to the large majority of consumers.

Grimes Golden and Jonathan apples, as grown in southeastern Nebraska, when properly graded, and suitably packed, command very satisfactory prices even in competition with the famous fruits of New York or Oregon. The chief points in fruit growing is adaptability of varieties and care of plants.

Forest Trees for Slope Lands and River Bottoms.

Frank J. Phillips, Professor of Forestry, University of Nebraska.

It is not yet a generation since the demand for land began to intensify over the United States as a whole. From single ranches which stretched as far as the eye could see, thousands of homesteads have been made. From the so-called deserts of the middle-west have arisen powerful agricultural commonwealths, richer than many European nations; from the days of the prospecting pioneer we have progressed to the days of the developer. Land once went a-begging; now, it is being searched for at prices far beyond the fondest dreams of our fathers and the demand steadily increasing. It is generally recognized that most of our agricultural land is already in private holdings of moderate size and the question now before the people is the one of best use.

What to do with our slope and flood lands is a problem of great importance. Our soil experts have found that it is a serious problem to maintain soil fertility and soil moisture on many of the best level lands. On slope lands the problem is a much more difficult one. Farmers frequently find that the crops of their slopes are not paying for the cultivated crops such lands will produce. Orchardists may secure fair to good crops but are often confronted with soil washing. The grazing expert and the forester find that forage grasses or forest trees are usually the most satisfactory crops that can be grown on slopes on slopes steeper than 15 to 25 degrees, according to slope and locality.

Foreign Experience as a Guide.

Many foreign countries have already had experience with such problems. Italy, Spain and Portugal have all suffered from terrible floods which have largely resulted from the removal of forests on slope lands. It has frequently been said that one whole province in Spain, once prosperous, is now almost an entire desert as a result of removing slope forests. In southern France, favorable slopes are largely terraced and used for grape culture. In China, many of the steeper slopes are terraced for crop production, but the destruction of the forest has proceeded to such an extent that even such an exceptional treatment is not productive of good results. In Switzerland and Germany, most of the mountain regions are characterized by farms in the valleys, pasture

land on gentle to moderate slopes and forests of moderate to steep slopes. In our own country, agriculture has been tried on the slopes of the southern Appalachians and has proved a dismal failure. Immense areas, such as occur in the White Mountains have been demanded of their timber and great erosion of the soil has followed without the aid of a plow. Throughout the middle-west, erosion has occurred on moderate slopes to a considerable extent, and no state in the Union can afford to disregard the importance of protecting such areas.

With us in Nebraska, the question of what to do with our slope lands is an important one. Some of our most important streams rise in the forested slopes of the Rocky Mountains and we shall always be interested in the treatment these lands secure. From the picturesque bluffs bordering the Missouri, to the hills and small mountains of Pine Ridge, we have a large amount of scattered slope land interspread through the rich prairies. On the gentle slopes in this state, the use of such crops as alfalfa and fruit have given excellent results, but on moderate slopes it is largely a question of forage grasses or forest trees, while on the steepest slopes, the forest becomes almost a necessity.

Advantage of Planting.

The advantage of planting forest trees on slopes are many. We have a large area of gullies, rough ravines, bare slopes and eroded areas, which are not only a loss to the farm, but are unsightly. Not only could these areas be made productive by planting forest trees, but such growth would add materially to the beauty of the farm and the beauty of the state. Hill-sides will often support as trifling forest growth as the more favorable agricultural sites, and in addition such tree planting is usually more attractive than it could be on level areas. In the hilly land about Ord, Nebraska, are to be found many fine forest plantations of considerable acreage, in which green ash, honey locust, cottonwood, and white willow have given the best results. The hardy catalpa is being tried on gentle slopes in various parts of the state at the present time, and in many regions there is no doubt that this tree will be found to form a very desirable plantation. Several plantation owners in the vicinity of Ord have stated that they consider a 10 to 20 acre forest plantation worth from \$500 to \$1000 in the improvement that it gives to the farm. Many of these forests are on the poorest land on the farm, yet have given profitable yields in fence-posts and repair material. It is in this locality and the eastern half of the state where the most interest is being taken at the present time in the planting of broad-leaved trees on slope lands.

Government and Experiment State Work.

Forest planting by the government and experiment station is an important part of this slope work. The government has reserved over 400,000 acres of sandy lands for forest planting, and has its largest nursery

located at Halsey in Thomas County. This nursery comprises nearly ten acres of seed-beds and transplant beds, with a capacity of seven to ten million trees. Jack pine, western yellow pine, and Scotch pine, are the principal species that are being used. North and east slopes have been found to be best suited to forest growth and are being most extensively planted. A combined system of farming, forestry and grazing in the sandhills would greatly increase their value over that of being used solely for grazing. Experiments in slope land are also being tried at the State Experiment Station at North Platte, and give promise of considerable success. The highest slopes are being planted without any preliminary cultivation of soil or any subsequent care of the trees, except to protect the stands from live stock. Red cedar once grew over many of these slopes under much worse conditions than now prevail, and a large number of evergreen species will be tried in an endeavor to find the species best suited to this region. As a result of the agitation and experiments, both by government officials and the men connected with the Nebraska Experiment Station, private interests are doing an extremely large amount of work in afforesting the sandhills.

Importance of Remaining Natural Forests.

In the southeastern portion of the state, along the river bluffs, occurred most of the natural timber which originally grew in eastern Nebraska. One of the most noted stands of natural timber was found at the mouth of the Platte, where there was an exceptionally heavy stand of cottonwood. Stands of bur oak occurred along the hillside bordering the course of the stream for long distances. Many of these natural stands of oak covered from 100 to 500 acres, and several thrifty wood lots still exist as remnants of this growth. The early records show that the Omaha land district contains two million five hundred thousand acres. This region was noted as being the most heavily timbered in the state and an area of 75,000 acres was classed as timber land. It is probable that a much larger area than this was covered with scattered stands, which were interspread among the areas classified as distinctly agricultural. It was a poor stand of this type of forest which the Hon. J. Sterling Morton improved so well at Nebraska City, and which may be found at the present time encroaching upon the slopes in various localities all over the eastern two-thirds of the state. Several fine stands have been noted during the last year's investigation in Nuckolls county, Nance county and Antelope county. The most important species in this type of forest are bur oak, green ash, cottonwood, hickories, elms, honey locust and several minor species. As one travels west, the number of species in the bluff and slope forests becomes less, until green ash and bur oak are the only representatives.

In the northwestern part of the state occur slope forests in which the western yellow pine is the principal tree. These forests are much more open than the broad-leaved forests bordering the Missouri river, because of the less favorable sites on which they occur. These areas were

drawn upon very heavily when the Burlington and the Chicago and Northwestern railroads were put in this region. Settlers have drawn heavily on the supplies, and are still using natural timber to a large extent. Pine trees have been reported having a diameter of four to five feet, and there are still large areas on which grow trees of two to three feet in diameter; each tree being capable of yielding two or three 16-foot logs. These trees grow on the poorest sites in the entire region and forest tree production should be greatly encouraged. An important feature of these forests is that good quality of seed which they produce. The Seeds are larger than have been found on the same species in any other locality, and they probably have a greater vitality than the same kind of seed collected in the Black Hills, the Rockies or the Cascades. During seed years, moderate to large-sized trees produce from one to fifteen bushels of cones, which yield from one to two pound of seed per bushel of cones. Such seed is worth from \$1 to \$3.50 per pound according to the condition of the market. The collection of this seed could be made quite an industry in this locality and would pay large profits to the seed collector.

River Bottoms.

More important per unit of area are the forests which occur or may be grown along our stream courses. No soil binder is so efficacious as forest trees and more attention all over the country is constantly being paid to this method of holding the soil. In numerous places along every stream course in the state, erosion is taking place, while still other areas are being badly silted. The need of maintaining a forest cover over these lands usually varies with the size of the stream, character of the soil, meandering of the stream, and the amount of treeless area along the banks. Such damage already amounts to thousands of dollars annually in our own state, and many other states have suffered to a much greater extent than Nebraska. Sioux City, Iowa, is at present working on the problem of holding the river banks in place, and is finding it difficult of solution.

Needs of the State.

On various steep embankments, where the stream flow is rapid, it may not be possible to establish tree growth without the aid of dams, levees and revetments. However, along most of our river bank areas and overflow lands, forests may be established with comparative ease. In Nebraska, the trees which are best suited for such a purpose are the white willow, cottonwood and American elm, while occasionally hardy catalpa may be found to be very effective and very profitable. The great value of the first three species mentioned is their ability to grow to the water's edge and to form a thick mass of binding roots. These trees may also be planted without disturbing the soil by plowing, since they are usually able to kill out grass and weeds. Over most areas, cuttings of the willow and cottonwood may be used, which the owner may collect from trees growing in the immediate locality and which should

not cost more than 50 cents to \$1.50 per thousand. Cuttings may also be purchased much cheaper than seedlings.

One of the best hardy catalpa plantations in the West is in the Mississippi bottoms, where it is subject to overflow nearly every year, and has been flooded at one time for even a month. The famous Yaggy plantation in Kansas is only five to six feet above the water table and is being grown on sandy soil. It has not yet been proved upon how shallow a soil above water table catalpa will succeed, and much work should be done in the near future in proving the value of this tree for river bottom plants. In many localities, if willow is planted along the edge of the stream with cottonwood some distance back and hardy catalpa still further back no more effective and profitable combination could be used. Such growth should not only prove of great service in holding soil and preventing the bad influences of flood, but should also bring good money returns to the owner.

Natural Factors to Help.

Not only should active measures be taken toward tree planting along river courses, but great care should also be taken in managing the forests which still remain along many of our streams. The most luxuriant tree growth occurring within the state has always been that bordering stream courses. Natural factors on this class of land are more favorable to tree growth than on any other quality of site in the state, and it will always be comparatively easy to maintain forests where Nature works with man rather than against him. The list of trees which grow along our stream courses comprises all the most important trees that grown within our borders, and with most of them natural reproduction is prolific. Several natural stands which were cut over in the early history of the state have reproduced naturally and are being cut for the second or third time. Great results have been secured by protecting this natural timber from fire, over-cutting and over-grazing. Live stock may always be allowed in natural stands of timber along stream courses, but should rarely be allowed to run in the wood lot the year around, as is sometimes the case.

Forestry work on slope and flood lands is steadily growing in importance and is bound to be one of the important lines of forestry work in the state. Such lands as are unsuited to agriculture but which will support good tree growth should be kept in forest or planted to forest trees as soon as means will permit. Reports coming to the Forester of the Experiment Station show that this work is rapidly gaining in importance and that a good beginning is being made. Comprehensive measures for a complete study of the whole problem should be undertaken in the near future under competent foresters and engineers, and adequate plans should be made for every section of the state concerned.

SUGGESTIONS FOR CARE OF TREES AND PLANTS.

E. F. Stephens, Crete.

The Orchards.

The old orchard, that is trees 12 to 15 years old and older and already in bearing, will be benefitted by heavy applications of stable litter or other fertilizer. To the extent that stable litter can be procured, we have been in the habit of using about five hundred pounds for each tree of the age of fifteen years and upward. This litter distributed about the tree, never in contact with the trunk, increases the stock of humus in the soil, lessens the winter evaporation and injury from dry freezing.

In the last two years, we have hauled in some three million pounds of stable litter or manure from the town stables and stock yards. Careful observation for thirty years indicates a benefit of \$1.00 per load for each of the first two years following the application and that the beneficial effect is not wholly lost during a period of eight years. We prefer to use stable litter rather than straw to the extent that we can secure the same. An application of three inches of stable litter is better than ten or twelve inches of straw.

Where stable litter cannot be had in sufficient quantities to mulch the row to a width of eight or ten feet, straw stacks may be used to excellent advantage. The hauling of stable litter and straw is suitable work for the months of December and January. Where the application of litter and straw is confined to the width of eight or ten feet and the remaining portion of the ground between the rows kept under annual cultivation, the roots of the trees are not brought to the surface as would be the case if the entire surface of the orchard were heavily mulched and this mulch allowed to remain on year after year.

Rabbits.

Rabbits usually do little harm to an orchard after it has attained the age of eight or ten years, but orchards recently planted and orchards up to the age of perhaps eight years should receive protection. In our branch orchards, we have used about twenty-five hundred wooden veneers; these veneers costing \$5.00 per thousand, can be tied about the young trees and form a fair protection against rabbits, during the first three or four years after planting. If the veneers are of excellent quality, they may perhaps last four years.

Where it is not convenient to secure veneers, we have protected thousands of trees by the use of corn stalks. Cut a suitable number of corn stalks of a length of 24 to 30 inches, tie top and bottom to the trunk of the

tree. The gradual decay of the corn stalk allows the tree room to expand and it is rarely necessary to take the trouble to go around and cut them loose, as they will ordinarily rot out and drop away. We have also used slough grass and rye straw.

In case the number of fruit trees to be protected is so large that it is not convenient to tie up each tree, then it is well to remember that the rabbit has a sensitive nose and can be kept away by applying a combination of blood, soap and tobacco juice, using a swab. Sometimes we have added red pepper, crude carbolic acid or any other offensive ingredient. The use of a slight amount of flour in the combination makes it more adhesive and less liable to wash off.

The cheapest tobacco can be procured in the form of leaf stems from the cigar maker. We steep these tobacco stems and then to that add the blood, soap and any other ingredients convenience may suggest to use. This will be less disagreeable to apply, if used while warm, otherwise it is a cold job on a chilly day.

Many thousand of trees are annually lost from the depredations of rabbits and trees can be protected at a less cost than 1 cent per tree.

Pruning.

While the commercial orchardist will commence work during the sunny days of December, because he has so many trees, it will take the whole winter to prune this orchard, yet the farmer or planter who has only a family orchard should defer pruning until March. The reason therefor being that if pruning is done just before active circulation of sap starts in the spring, the cut surface dries and checks less and the wound heals over more quickly.

In pruning, in the case of young trees, start the tree with a sufficient number of branches to make a rather open head. From season to season, prune sufficiently to keep the head of the tree well balanced and reasonably open. A tree with an open head can be sprayed more thoroughly than when the tree is allowed to grow at will. It is usual to cut out the suckers or water sprouts, the dead wood and the broken branches.

It should be remembered that the cherry tree requires very little pruning. The cherry is more sensitive to the loss of wood or the cutting away of any portion of its top than other varieties of fruit trees and rarely requires more pruning than to remove the branches which interfere with each other by crossing.

Plum trees require comparatively little pruning. In the case of young trees, shorten in the strongest shoots which out grow the others to the extent of unbalancing the form and symmetry of the tree.

Considerable amount of pruning might be done in the month of June, if there was at that season of the year, time for the work. The average planter however, finds the season crowded so full of duties that he must prune in winter or not at all.

The Vineyard.

While the grape vine is reasonably hardy throughout southern Nebraska, yet the variety of our winters is such that there is a lessened evaporation and a stronger and more vigorous vine, if in our trying climate, it can receive some winter protection. In case the winters should be very, very dry, there is danger of root killing. In the vineyards belonging to the late Ex-Governor Furnas at Brownville, some years ago, ten thousand vines were lost by root killing. This by reason of a severely cold and very dry weather, therefore, we have found it well to trim our vineyards each autumn. The fruit next year is formed on the new wood of the present season's growth. The object of pruning is to shorten the new growth, leaving approximately the amount of fruiting wood which the vine can safely carry. It will be found wise to shorten the laterals to three, four or five buds, depending on the varieties and to some extent, on the age and vigor of the vine. The buds left on the laterals develop next season's fruit. The main canes are shortened to suitable length depending also on the age and vigor of the vine.

After pruning, we cut the vines loose from the trellis, drop them on the ground, put two or three forks full of straw over each vine and over that place sufficient amount of soil to keep the straw from blowing away.

We would figure the expenditure of 3 cents per vine as being sufficient for pruning, hauling the straw, covering and protecting the vineyards for winter.

Mulching the Small Fruit Plantation.

Currants, gooseberries, raspberries and blackberries should be very heavily mulched before winter. Stable litter is usually the most convenient for mulching currants and gooseberries. For many years, we have used straw in the raspberry and blackberry plantations. In these plantations, we allow the straw to remain on the rows the entire season, with the result that it checks the growth of weeds, and retains the moisture for the benefit of the plantation. Since adopting this method, we have never failed to secure a crop of fruit. About the time the ground commences to freeze, the strawberry plantation should be thoroughly covered with old hay. Why? Because old hay is free from weed seed. A covering of an inch is sufficient. In very windy districts, it is sometimes necessary to confine this covering by occasional weights, lest it should be blown off by high winds, but after it is matted down, it usually sticks the winter through. We have often times used stable litter, preferably litter from stables where prairie hay was fed. Not wise to use litter from stable where clover is fed, since it is liable to result in a considerable amount of clover springing up within the plantation. Failing to get either hay or stable litter, use straw, selecting that which is as free as possible from weed seeds.

Home Grounds, Ornamental Shrubbery.

At this season of the year, it is not difficult to collect a great quantity of leaves. Leaves have been blown into ditches and sheltered places and can be gathered very rapidly. They will be found very useful as a covering about ornamental shrubbery, roses and bulbs, one of Nature's own and best protections.

A heavy mulch of leaves or fine litter will be found a great protection to the root system of ornamental plants. In Nebraska, our winters are likely to be very dry and this soil cover lessens the soil evaporation and the danger that the ground will freeze dry during the winter.

Roses.

Tea roses and half hardy roses may be protected by first making a mound of earth, sod or other material over which to bend the rose bush. Over this florists usually cover with soil. In many places sods can be procured and a covering of sods will not blow away.

Tea roses may also be cut back half, leaving them perhaps 12 to 18 inches in height. They may then be boxed in and covered with leaves or fine chaffy straw or old hay. With this amount of protection, they usually winter safely.

An excellent method of growing tea roses is to make a border 4 to 6 feet in width by 6 to 8 feet in length, according to the grounds. A border of this character will contain 15 to 20 roses, giving a choice assortment of varieties. This border may be surrounded by boards 12 inches high and filled in with leaves or short straw, giving adequate protection.

In exposed and trying locations, it is often times judicious to take down climbing roses, wrap in burlap, or cover on the ground with leaves, old hay or litter to lessen the trying evaporation of our wintry winds. It is apparent to anyone that the animal which has a comfortable stable during the winter, comes out in better condition in the spring than the one exposed to winds of winter.

While our hardiest varieties of roses may endure the evaporation of our trying winters, they will however, come through stronger and give better results the coming season if they can receive a fair measure of protection during the winter. In the spring time, the soil protected by a suitable mulch will be found in much better condition than that which has been exposed to the evaporation of our trying winters.

The Lawn.

The lawn needs shelter during the winter, first it should have a considerable growth of its own grass allowed to remain through the winter instead of being cut late in the fall by the lawn mower. Second, a mulch of any vegetable matter, leaf mold, leaves, rich manure applied in early winter will protect the grass roots from the trying, arid winter's cold and bring the lawn through in condition to give a much

more vigorous growth of grass the coming season. I noticed today that about our office where the grass has never been cut short late in the fall, that we have a much better sod than about the residence where the lawn mower has been run a month or six weeks later than is judicious.

Fall Planting.

It sometimes happens the planter has more leisure for planting in late autumn than in early spring, during which season, he is rushed with the seeding of farm crops. In case the ground has a suitable amount of moisture or water can be conveniently secured to make it sufficiently moist, then certain varieties of small fruits may be planted in late autumn. We have found that grape vines planted in early November, after the wood was well ripened and matured, made a stronger growth the succeeding season than when planted in the spring time. We, however, always take the precaution to heavily mulch, cover, bury each vine so planted.

Raspberries and blackberries may be planted at the same season and the currant also, if heavily mulched and thoroughly protected.

It is rarely wise in Nebraska to plant fruit trees, shade trees or forest trees in the fall, since under ordinary orchard or field conditions, there is too great risk that the trees may suffer from drying out before the opening days of spring.

It is legitimate however, to dig the trees in the fall of the year and bury them root, body and branch, carrying them over the winter in readiness for early spring planting. Tens of thousands of trees are lost every year by planters who receive trees and simply heel them instead of burying the tree root, body and branch. In the case of fall planting or fall burying of trees, it is wise to have trees and plants properly and thoroughly ripened before digging.

NOTES FROM NEBRASKA EXPERIMENT STATION, YORK, NEB.

C. S. Harrison, York.

Lilacs.

These are often call Syringas and the shrub known as Syringas is called Philadelphus. There are 150 kinds in cultivation and new ones are being added yearly. Raising from seeds gives new varieties.

At the Brandon Experiment Station in Manitoba there is a fine hedge of Lilacs. There is quite a variation in the bushes. Some are dwarfish and some are strong growing. The superintendent said there was also quite a diversity among the flowers, many of them varied from the parent. If these had been sorted out perhaps half a dozen new kinds could have been added to the list. In the East we noted quite a variation in seedlings raised from the Villosa. Here at York we are engaged in originating new sorts.

Different Groups.

There are the small and narrow leaved ones. Three of these belong to the Persian family. The purple Persian is very hardy and is a much surer bloomer than the old common one. The white Persian has small delicate branches covered with pinkish white flowers. There is also the exquisitely delicate cut leaved Persian with purplish flowers. As a shrub this is very beautiful, unfortunately it is not always hardy. Then we have the Rothomagensis, which is also called the Rouen, because the cross between the purple and the old Vulgaris was made at Rouen. This closely resembles the Persian, except that the leaves are a little wider. It is one of the hardiest and most popular on the list for the great bleak Northwest. The white Rouen has a purplish white flower. This is somewhat trickier. Some years it will have pink blossoms. One season I noted three twigs on one branch, two of them had white flowers, the other had pink ones. One year I noticed the whole collection were pink instead of white. The white one will often disappoint and the nurseryman will be blamed for sending them out when he is not at all responsible for their freaks. They generally, however, are true to their name. In this group also we have the Siberian white, which closely resembles the Rouen. This is one of the hardiest on the list and gives beautiful masses of bloom.

This group does not spread from stolens or root enroute like the common sorts. The clumps, however, spread out like current bushes. They can be pulled apart and a stem with a small piece of root will grow.

If the root is small the stem should be cut back to six inches. A three year old plant will often produce a dozen if treated in this way. In two years these sprouts will make good bushes to sell or set out.

The Summer Blooming Group.

At our experiment station here in York we have all these varieties growing and are well pleased with them. The common kinds are so often injured by late frosts that we cannot expect blooms oftener than once in three or four years, while these bloom so late they escape all the frosts and are often covered with glorious mantles of splendor. They are not quite as rich in varied colors as the large *Vulgaris* family, yet they are charming additions to the wealth of our gardens.

They are unique in appearance with large leaves. You would not take them for lilacs unless you saw them in bloom, then their rich foliage and bountiful blossoms make them very attractive.

The Emodi.

Is from the Himalayas, the home of many of our shrubs. This has very large leaves. It is somewhat coarse in growth. Its flowers are pale purple, often in great profusion. I have received three sorts under this name from France. The one just described, also one of slower growth and smaller leaves. Then the varigated form which is of great beauty. These three are not perfectly hardy. The varigated one needs wrapping in winter. Several of our Eastern firms send out the Emodi for the *Villosa*, which is entirely different and much hardier. Of over fifty kinds which we have tested only the Emodi and cut leaved Persian are tender; all the others will do well any where in the West and Northwest.

The Hungarian Lilac.

The Hungarian Lilac, called *Josikaea*, is a very fine bush, growing six to eight feet tall and in June it is covered with spikes of mauve flowers. This is a compact upright grower and very desirable.

Dr. Bretschneider.

This is a fine shrub with very large leaves, overwhelmed with bloom in June. It is very hardy. The flowers are very pale pink fading to pure white. This is one of our best. We have succeeded in raising about a thousand seedlings of this variety, fertilized with other summer bloomers. This will soon come into bloom and we expect to find some choice hybrids among them.

The Villosa.

The *Villosa* is considered the finest of the group. We saw it growing in Manitoba. It has rather pale purple flowers. For the first few years you may not be impressed with it, but some June you will see it

covered with such a mass of bloom that the whole bush seems one glorious bouquet fit to adorn a king's palace. This group does not sprout from the root. You can dig a trench and pull down the branches and bury them six inches deep leaving the tops out just as you would the Snowball and you can readily multiply them by layering.

The Ligustriana.

The Ligustriana, also called Amruensis or Russian, is a sort of a cross between the bush and the tree lilac. It grows straight and takes the tree form though not as rank a grower as the Chinese or Japanese tree lilac.

These last mentioned are trees. They need some training while young, but when once compelled to take the tree form they grow nearly as fast and as large as our native ash.

In the Arnold Arboretum of Boston, I measured a Japanese tree lilac twenty years old which was thirty inches around three feet from the ground. It is said that in the mountains of Japan they are sometimes a foot through and fifty feet tall. Our picture shows one of these trees on our grounds in full bloom when the whole tree is crowned with flowers. This is an important addition to our ornamental trees and proves hardy even in Manitoba. It is often propagated from cuttings which, however, must be well calloused before planting.

The Chinese Tree Lilac, *Syringa Pekinensis*, is of a different type. The leaves are small and the twigs are slender. We have some eleven years old that are about eighteen feet tall and four inches through at the base and would make fair sized fence posts. These need a little attention at first to make them assume a tree form and even then it is hard to get a stem that is perfectly straight, yet it makes a fair sized tree. When the *Pekinensis* is crowned with a great mass of white honey scented flowers it is very attractive. An avenue of these trees would add much to the beauty of the landscape. The twigs are so small they often assume a pendulous habit. They are sometimes grafted on the stem of a common lilac, when they make beautiful weepers. Both these trees are June bloomers, often extending the time of flowering down into July. They do such a wholesale business that they can blossom only every other year.

These with four others mentioned give us six summer bloomers. Some one should graft the *Villosa* and *Bretschneider* into the Japanese and so secure a colored flower.

A dealer once said he had secured some beautiful purple lilacs. I told him there were no such trees. He insisted on it and said they were very fine. Visiting the firm which furnished them I asked to see their tree lilacs. They showed me a row of really fine looking specimens of the common lilacs budded on privet. Thus propagated they cannot sprout from the root, but alas, the borers had found them and had ruined every one of them. The borer is bad on the whole *Vulgaris*

family and will often kill the main stem, but the plant is saved by throwing up new shoots. I know of no way to keep out this pest unless it be by keeping the stems washed with lime and sulphur. Fortunately the borer seldom works on the tree lilac and is not bad with the summer bloomers as with the common sorts.

The *Vulgaris* Family.

If you ask most people how many kinds of lilacs there are, they will say two, the purple and the white. A bystander better informed will say there are three and will add the Persian. The common kind seems to vie with the Canada thistle and will often beat it in multiplying. This family now so divergent in form and flowers is susceptible of great improvement and the number of new ones placed on the market is astonishing. Nor is this to be wondered at. Take a clump of fifty, the flowers of which are well fertilized by the bees and you must have a large variety as a result. Once start with a dozen or twenty varieties, plant the seed and you must get something new. Some plant the seeds of the old kind in hopes of securing something better, but as "like produces like" there is little show for improvement.

In the new sorts now on the market there is a great difference in their sprouting capacity. Charles the Tenth multiplies rapidly, while Senator Volland and Pyranidalis increase slowly.

We have in these numerous varieties a wide range of colors and both the single and double flowering ones.

Single Flowering.

We have only a few of the long list

White—*Vulgaris Alba*. The old common sort, very hardy, flowers cream colored, but a very shy bearer, perhaps it will not bloom oftener than once in five years.

Verginal have a dainty white bloom, very sweet and attractive, but this is not a profuse bloomer.

Grandiflora Alba is a prolific bloomer and has great spikes of lovely flowers.

Frau pammann has large pinacles of pure white blooms, very desirable.

Marie Legraye is one of the most popular of this color and is much for forcing in the green house.

Princess Alexandra has a glorious crowns of purest white.

Other Colors.

Coerulea Superba, originated at Rochester. This is a strong grower, very robust, flowers clear blue, of great beauty.

Charles the Tenth is a general favorite, much use for forcing. It has large trusses of reddish purple.

Insignis Rubra, we have found to be a very fine bloomer.

Conga, has wine red blossoms.

Cloire de Moulins proves satisfactory with long pinacles of delightful rosy red flowers.

Ludwig Spaeth. Was great clumps of dark purplish red blossoms.

Prof. Sargent. Buds cherry red, flowers dark violet.

Double Varieties.

The evolution of this type has been the result of much patience. As in the case of the Dahlia, nature produces the single flower, but nature must have the aid of art to produce the double form and here we have one of the triumphs of modern horticulture. Some of the forms are marvels of loveliness.

The Double Whites.

Madame Casimir Perier. I think this one of the finest of all. White lilacs are often very shy and tardy bloomers, but I have had this in full bloom when only eight inches tall, the row clearly defined by the clear white flowers clinging to tiny twigs just peering from the grounds. These must take a prominent place and we are importing them in large quantities.

Madame Lemoine. This is one of Lemoine's creations. He is one of the florists of the age. This is a fine bloomer, flowers large and fragrant.

Obelisque, is another charming variety.

Rabelias. Also gives us white flowers.

When buying, you can tell by the color of the buds whether the flowers will be white or not. The buds are invariably of a creamy color. When grafted on roots of the common sorts you can easily tell which are spurious from the color of the buds.

Other Colors in the Double Form.

Alphonse Lavelle. Has large spikes of beautiful blue, shaded violet.

Belle de Nancy. Another of Lemoines—has very large flowers of satiny rose.

Charles Joly. We have been delighted with this variety and are increasing it as fast as possible. Superb blooms of dark reddish purple.

Emile Lemoine. Named from the son of the originator. Vigorous in growth, rosy lilac, globular form.

Jean Bart. Another which has given us delight. Trusses large and compact. Blooms of rosy carmine produced in great abundance.

Michael Buchner. Erect pinacles, flowers very double, color pale lilac.

President Grevy. Has very large trusses of magnificent blue flowers—one of the best.

Senator Volland. Has very compact double blooms, rosy red.

Propagation.

There are several modes of increasing these shrubs. The four summer bloomers can be multiplied by digging a trench, pulling down the limbs and burying them six inches deep. Leave the tops out. Cut off the layer and plant it in the fall or early in the spring—it will be well rooted. Most kinds are budded or grafted on the privet. There are two objections to this. You get but one stem and often the borers will get this and it is done for. Again these shrubs are very hardy for the great Northwest, and the privet is very tender, so the bush in a hard winter will have the foundation knocked from under it. Some growers in the Northwest utterly refuse those on privet roots on this account. The difficulty can be obviated by planting very deep, compelling the lilac to grow out of roots of its own. The common green ash of the west is hardy enough and makes an excellent stock on which to bud or graft. In grafting, do as when grafting apples for the nursery, a piece of scion and a piece of root and a lip graft. The root of the common *Vulgaria* is a hardy stock on which to graft. This has two entirely distinct root systems. The laterals creep out and sprout like the mischief—they are quite pithy, but they are full of vitality and other sorts will grow if grafted on them. But beware what you graft or you will get fearful mixtures. As we have said all the white sorts have light colored buds and you can separate these. The tap roots are safe anyway, for they can't sprout. You can put any kind you please on them. The roots of the Rouen and Persian do well if used for the *Vulgaris*. The tree lilacs take well on this stock also. They also take well on the laterals of the *Vulgaris*, but they will come up and rival their neighbor and crowd it out if they can. We often at the end of a year dig up the plant and cut off the foreign root. If it has been set deep it will throw out roots of its own. Plant it back and it has its own roots.

Grafts of Lilacs are extremely variable. Some springs they knit and grow readily. At other times not one in a hundred will take. I note they do best when grafted late and planted immediately.

Raising from Seeds.

Some years after bountiful blooming they will bear an enormous crop of seeds. These should be picked as soon as they turn brown. Keep them dry until early spring; put them in moist sand for a time, then plant out in good season. The *Japonica* is slow about germinating. These are usually started in the green house. These seeds must be watched closely and gathered as they are turning for they will spill out much sooner than other kinds.

Forcing Lilacs.

Of late years much attention has been paid to this branch of floriculture. By careful preparation the plants are prepared for the green house where they bloom in great profusion and come out early in the season. As

there are no frosts to check them or winds to bruise them, the flowers have a delicacy they could not have in the open.

Those used for forcing are often transplanted or are grown in pots, so as to keep the roots compact for a strong root system is always needed to produce abundant blooms. Sometimes, a little before blooming, just as the buds are swelling, branches are cut off and kept in vases of warm water. This will hasten the time of flowering and some times give blooms for a tardy Easter in the Northern States.

We have been thus explicit, giving away many of the cherished secrets of the trade because we want the people, farmers and others, to take an interest in their propagation. Billions of them should be used to glorify the great prairie lands. We have just begun with them. I know of but one place which has a full collection, and that is a very progressive nursery which will have fifty kinds and yet their possibilities seem endless. When you know that you yourself can multiply them and originate new kinds, you will begin to have greater respect for yourself and for your own abilities. Horticulture should not be a sealed book to the farmer. It is a part of his calling as much as grain growing and stock raising. The great trouble with him is he uses but a small part of himself or of his capital.

OUTLOOK FOR COMMERCIAL ORCHARDING IN WESTERN NEBRASKA.

E. F. Stevens, Crete, Neb.

The recent exhibit of fruit at Spokane, Washington, December 9th to 16th, where an exhibit amounting to probably 10 or 12 carloads was gathered together, was an interesting place to study the products of irrigated orchards. The next week, doubtless some of you were able to visit the exhibited at Council Bluffs, where samples of fruit grown under irrigation could be noted and compared with fruits grown by cultivation. During the past 2 years, I have been enabled to visit other exhibits of irrigated fruits, notably that of the state of Washington at North Yakima.

There can be no question but what the Orchardist who has the advantage of being able to apply water just when he needs it and to any extent that he may desire, has an advantage over those of us, who are growing fruit on lands which can not be irrigated, and we can only depend on moisture stored from the normal rainfall.

Normally under irrigation, water has an original cost of from \$15.00 to \$60.00 per acre and then an annual maintenance cost of from 75c. to \$5.00 per acre, the higher cost under pumping plants. These rates seem expensive, perhaps we might say excessive, and yet I have oft times thought here in Nebraska that if in the months of August and September, I could have had an abundance of water to use in our laden orchards, that the fruit would swell up enough and be enough larger to justify almost any expense. \$20.00 an acre annually would be a very small charge in comparison with the benefits secured.

Millions of trees will be planted during the next 5 years under irrigation on the Pacific slope. While they have the advantage of the favorable climate, fertile soils and usually water for irrigation, in many cases the orchards are watered through the medium of very expensive pumping plants. The far famed district at Palisade, Colo. is supplied by a pumping plant. A part of that water used in irrigation is raised 81 feet.

All these regions are hampered by being a very long distance from their best markets; the fruit has to be transported across mountain ranges, involving very expensive transportation.

In discussing commercial orchards in Nebraska, our minds immediately revert to the orchards in Richardson, Otoe, Cass, Washington, Douglas, Saline, Fillmore and other eastern counties. Orchards were first planted in this portion of the state. Here are to be found the older and larger orchards. The average man is perhaps not aware that in western Nebraska we have 3,000,000 acres of irrigable land, that some 1,600 miles of irrigation canals or ditches are supplied by the Platte river. In fer-

tility of soil, abundance of available water, care of application, low cost per acre, these lands compare very favorably with any in the union; moreover the principal valleys are near important lines of communication. The Platte valley is contributory to the Union Pacific and the Burlington systems and contains within its own borders an immense area of fertile soil. The Platte river affords more available water for irrigation than any other one system in the union, and with its superior advantages of transportation, being much nearer the principal markets of the country than Colorado, and in a marked degree nearer than California, Washington, Oregon and Idaho, the development of these lands must be very rapid as its advantages become known. The attention of all the horticultural public is directed thereto and capital and labor, hand in hand will develop its waiting resources.

The ditch in Keith and Lincoln counties, under which the David Hunter orchard is located, 34 miles in length, was constructed at a cost of less than \$1,500 per mile, and perpetual water rights were sold thereunder at \$10.00 per acre. Compare this with \$35.00 to \$60.00 per acre a cost considered not unreasonable, in the Interior Basin and on the Pacific slope.

It seems to me that the advertising now being given to fruit of the Interior Basing and of the Pacific slope, will have a tendency to call attention to the irrigable lands of western Nebraska.

Coming now to the question of soil fertility, the soil in western Nebraska compares in fertility very favorably with the soil in eastern Nebraska.

We come to climate conditions. Our older branch orchards in western Nebraska have now been planted 12 years. Some of our customers planted trees away back in the timber claim period and have been growing fruit, that is their orchards have been in actual bearing for a space of 14 or 15 years. During this time, we have found that the orchards of western Nebraska did not lose their crop of fruit by spring freeze any oftener than our orchard in eastern Nebraska. Apparently elevation retards the blooming period, as we notice in the orchard of Ed Scriven, 20 miles from the Wyoming line, that his trees bloom from ten days to 2 weeks later than our own here at Crete. Now, since the cold waves of late spring which reach them, usually reach clear down into eastern Nebraska, and since their trees are oft times dormant at the time of the late April cold wave while ours are in full bloom or have set fruit, it has seemed to me that the orchards up near the Wyoming line, have a little bit the advantage over our own in Saline county, that is they have lost their fruit from spring freezing a less number of times than we have in Saline county.

We shall next consider the question of planting in the elevated regions of western and northwestern Nebraska. Ben Davis and Winesap suffer seriously from sun scald and from unripe wood. It is necessary to select varieties which by heredity have the habit of remaining dormant as late as possible in the spring and being ripe and ready for winter at the earliest possible date.

I remember not many years ago that I visited the Scriven orchard above noted about the middle of September. I came down through the hills from Alliance, looking far up the Platte valley, I could note that it was covered with snow as far as the eye could reach, and when I reached Mitchell and drove out to the Scriven orchard. I found the plum and apple trees laden with fruit and to this was super-added a burden of heavy wet snow, bearing the branches to the ground; about 4 inches of snow having fallen in this storm. Apparently the fall of snow protected the fruit from harm, the snow melted with an east wind, no harm was noted to the apple or plum. In an acquaintance of from 20 to 25 years in this district, I must say that this is the only time that we ever knew of the snow coming at such an early date in autumn.

Varieties. In the elevated regions of western Nebraska experience has demonstrated that the best results are secured by planting a different list of varieties from those we would regard as most commercially profitable in southeastern Nebraska. We discard the Ben Davis, the Gano, the Winesap and many others of that degree of hardihood. We secure the best results from planting such varieties as Yellow Transparent, Duchess, Wealthy, Northwestern Greening, Patton's Greening, Rawle's Janet, Longfield, Iowa Blush and others of similar type of hardihood.

We notice that under western conditions orchards commence bearing much younger than in southeastern Nebraska. In the Scriven orchard the Yellow Transparent yielded a common wash tub full the fifth summer from planting. In the same orchard the Northwestern Greening bore fruit at the age of three years from planting, and the fifth year from planting single trees bore a bushel of apples. In the David Hunter orchard a single tree gave a bushel and three pecks the fifth fall from planting.

The cherry maintains its health and vigor in western Nebraska and is found to be much more profitable than in the eastern portion of the state. The trees bear very young and in the orchard of David Hunter there has not been a single failure of the cherry crop since the orchard was planted.

Mr. Hunter had a full crop of plums in the year 1908. Apparently the comparative freedom from rain and unfavorable weather at blooming season is favorable to the profitable production of plums in western Nebraska. We note that plum trees bear very young and in our branch commercial orchards they give a much larger percentage of profitable crops than in eastern Nebraska. In one of our orchards within a mile of the Wyoming line where we planted some 400 plum trees, sixteen months later 250 of those plum trees were reported in bearing, and some of the trees bore a quart or more each.

Apparently the strawberry is well suited to the conditions of western Nebraska. In the W. H. Kortz plantation at Julesburg, Colo. one mile from the Nebraska line, from a plat of ground 2 5feet square 148 quarts of strawberries were picked, and this plat likewise contained four cherry trees. In the Otten strawberry plantation near North Platte they showed

me plats that had continued to produce year after year without renewal for eight, nine and ten seasons. With the facilities for irrigation afforded, the strawberry yields more abundantly in western Nebraska than in eastern Nebraska, and could we have the same skilled labor that is required to grow strawberries in the Hood river district, thousands of acres would be devoted to the production of strawberries. The growers are assured of a near and profitable market. They would be 1,500 miles nearer a profitable market than the growers in the Hood river district. Western Nebraska at the present time lacks skilled labor and trained horticulturists. Whenever this class of labor is developed on the field or moves in from other districts, this portion of the state should be heard from in the production of all of the minor small fruits and of certain iron clad types of apples.

I find that I have omitted any remarks concerning the peach. The peach trees in the Hunter orchard 318 miles west of Omaha have now been planted eleven years. They commenced bearing the third season. Three years there has been a commercial product to ship. The other seasons they have rarely missed a family supply. About 200 peach trees planted in this orchard. While we would not advise the commercial planting of the peach in western Nebraska, we have been surprised to note that some little fruit has been grown as far west as Lodge Pole.

Frost protection. The commercial orchardist in western Nebraska will no doubt commence to use such methods of frost protection as have been found useful at Grand Junction, Palisade and other Colorado points. Before this method was thought of some of the orchardists of western Nebraska had been using another method which apparently is sufficient to protect orchards and vineyards from harm to the extent of two to four degrees below freezing point. By accident, the laterals breaking, accidental late watering, and in other ways, it was discovered that if the waters from the ditch were turned loose on vineyards and orchards on frosty nights the crop was saved. In the Jim White orchard near Sutherland this method has been followed for fourteen years. He saved his grapes and plums in 1908. This method was discovered by accident the 19th of May, 1894. That evening Mr. White had watered his vineyard very heavily late in the evening. The next morning his vineyard was safe, his neighbors had lost their crop. Acting on this hint Mr. White has followed this method ever since with excellent results.

THE COMMERCIAL ORCHARD AND HOW IT CONFRONTS US.

F. J. Pratt, Humphrey.

From what we can gather good winter apples grown in any one year have not been enough to go around. It is estimated by our best of authorities that there are not enough good winter apples grown so that every man, woman and child on earth can eat one a month, or twelve a year. The rules of health say that every person should eat at least one apple every day. This means that the present population of the United States should consume 300,000,000 bushels of apples annually. But the average American apple crop is only estimated at 90,000,000 bushels (30,000,000 barrels). From this number the United States exported to European countries over 6,000,000 bushels last year being that the wealthy people of Europe paid more for this fruit than the American markets offered. The exportation of the American apple is increasing from year to year and the prices for good winter apples are getting higher every year, as the demand far exceeds the supply. The indications at the present time are that with our increase in population, that if fruit raising does not increase at a more rapid rate in the future than it has in the past, that it will only be the moneyed class of people and the producer himself that will have fruit, and the middle class or wage earners, will go without. We often hear it said by the inexperienced fruit grower or by the pessimist that Nebraska cannot grow good winter apples. This, however, is a mistake. The old adage is, "The proof of the pudding lies in the eating of it." The writer has just finished eating a Gano and Jonathan from a peck of regular show apples, received from the Humphrey Nurseries' store house, which were grown by Wm. Brockman on a farm four miles south and four miles east of Humphrey. These apples are of the finest quality it has ever been our pleasure to eat.

Mr. Brockman grew several hundred bushels of apples on his farm this year from a small orchard of only a few trees, among which he grew as fine Jonathans, Gano, Ben Davis and Jenets as can be grown in any state, and he proves his confidence in the apple culture for Nebraska by placing his order with our nursery here for 250 apple trees to plant next spring.

Nick Fehringer has been growing apples successfully for many years and had such a volume of a crop this year that he gave neighbors for miles around access to his orchard and still has barrels of cider and vinegar to sell. Mr. Fehringer says it pays big to grow apples here, and placed his order for a large commercial orchard to be planted next

spring. Mr. Fehringer built a beautiful house on his farm this year and by adding this commercial orchard he will surely have a real commodious country home.

Henry Schacher, ex-county supervisor of St. Bernard township, has been growing good crops of apples for many years on his fine farm nine miles west of here, and will add 750 trees of the standard commercial varieties to his already large orchard next spring.

Only a few days ago Wm. Foltz delivered some fine winter apples to Diers Bros.' store from his orchard, which has been bearing profitable crops for years.

Nick Van Dyke has some fine Ben Davis apple trees in his orchard which produce annually from six to ten bushels per tree. He has also proven his belief in the commercial apple growing industry by planting another large commercial orchard.

In the Stephen German orchard two miles west of Humphrey sixty-four trees of the Ben Davis, Gano, Winesap, and Janette produced over \$300.00 worth of the finest kind of apples for the crop of 1908 (the poor apple year) and this year the crop far exceeded that of last year.

Dr. Cordon, who, in the past year, visited the most extensive fruit district in the United States to study their methods of growing and marketing the fruit, declares that we have as good a fruit state as any state he has seen and signifies his willingness to plant a commercial orchard of ten acres here on the Park Place adjoining Humphrey. The Doctor says, "That fruit is absolutely necessary for the health of a man and that it should form a part of each meal. The apple is both a food and prolongs the life. The baked apple is the healthiest dish to start breakfast on, and an apple eaten just before retiring for the night will prevent sleeplessness and act as a tonic and brain food."

There are scores of other orchards in Platte and adjoining counties which have produced many profitable crops. I do not mean to say, however, that every orchard is profitable, in fact, the profitable orchards are very few, for in so many orchards the wrong varieties are planted.

The farmers in the earlier days did not know what varieties to plant and in many instances planted varieties not adapted for this climate and often planted too many summer and fall varieties.

These mistakes are not necessary now when home grown trees can be had and varieties which have been tested and proven profitable; besides, horticulture has made wonderful advances in recent years.

The nurseries are now building their trees upon more scientific principles and trees procured from up-to-date nurseries now are far better than trees procured in the past when they were propagated in the old and hit-and-miss way. The orchard demonstrations made by our scientific men from the Nebraska Agricultural College and Experimental Stations show that when the right varieties are planted and the orchard rightly managed that no crop is more profitable than the apple crop from the commercial varieties.

In my travels over the state as deputy oil inspector, the past year,

I have observed that the work done by the Humphrey Nurseries in this section of the country is grand and should convince the most skeptical that our state will ultimately become one of the greatest fruit growing states in the union. I have also observed that invariably their orchards are placed with the most intelligent, alive and up-to-date farmers. This alone will insure their success, and I can say from my observations that every one of their commercial orchards are a success.

When I look over the list of national honors our state has won at world's fairs and national fruit exhibits, I notice that in 1871 Nebraska won its first medal on fruit. This was awarded at the horticultural exhibition at Baltimore on general exhibit. The next was in Boston in 1873 and was given on account of the largest variety of pears shown by any one state—at that time Nebraska had forty-three varieties exhibited. The next prize was awarded in 1876 at the Centennial, when the state was given a medal for the best collection of fruit. At the World's Fair in Chicago, Nebraska won a medal for having the best collection of grapes. Prior to this time the state had won medals at Boston and Philadelphia, where it had shown its fruit. Yesterday, while calling at the nurseries here, I saw for the first time the gold medal won in 1898 at the World's Fair in Omaha for a continuous display of apples. In 1904, in St. Louis, Nebraska won several great honors at the fair there, and at the Paris Exposition, Marshal Bros., of Arlington, this state, won first and second prize on one of the leading varieties of winter apples. This year at the Horticultural Congress and Exposition at Council Bluffs, Iowa, Nebraska carried off the first prize for the best general display of fruit by any Horticultural Society in the Union.

When we consider that we have made better records in fruit growing than most any other state in the Union, in spite of the fact that so little attention is paid to fruit growing here, we cannot help but recommend to farmers who have their own farms to plant large orchards as long as the orchard so greatly enhances the value of their farm, gives so much comfort, pleasure and health, and if the orchard is of the commercial size it will ultimately become by far the most profitable spot on the farm.

The commercial cherry and plum orchards and the commercial vineyards are equally as profitable as the commercial apple orchards.

We learned from Fred Van Ackeren that his vineyard produced nearly \$600 worth of grapes this year and that it has produced many profitable crops in the past years. "Necessity creates modern inventions."

When there are enough small fruits grown here to support the enterprise, canning, cider, vinegar and jelly factories, dryeries and the denatured alcohol distilleries will spring up.

I have a paper before me which reports that eight canning factories will be built in the state of Washington the coming year. Is this due to a fact that they grow more or better fruit there than we do here? Of course not. But they have the encouragement of the transportation companies and a live set of real estate boosters. The transportation com-

panies will be pleased to always carry our surplus agricultural products to the extreme east or the extreme west and carry back their surplus horticultural products. Yes, we Nebraskans annually pay over \$2,000,000 to the transportation companies to bring the fruit we consume from foreign states and annually pay them about \$50,000,000 to carry away our surplus agricultural products.

The real estate boosters from western states will always be pleased to sell us Nebraskans their land planted to orchards at from \$1,000 to \$5,000 per acre, and they are justly entitled to these prices as the orchards pay big interest on the investment.

The transportation companies and western real estate boosters are composed of the most honest, upright, intelligent, wealthiest and best business men the world has, and hence will not work against their business interests, so we will not need to wait for them to boost the fruit industries for us in Nebraska. We will have to join hands and work together and grow what the millions want. We will say thank you, to those who have already planted orchards, and that you have built a monument which is far better than cold granite or lifeless marble. We say to those who can gather up enough courage, ambition, enterprise and Nebraska horticultural enthusiasm to plant a commercial orchard that they will never regret the undertaking and to those who cannot plant we will say boost. If the work is a success here as planned we will make this territory one of the greatest horticultural centers of the world and this would considerably increase the value of your land. If you cannot boost don't knock, but move an if you cannot do either you are dead and should report it to the officers of the Humphrey Commercial Club, who will attend to it that the club will pay your funeral expenses.

COMMERCIAL ORCHARDING IN NEBRASKA.

By G. W. Hervey.

The commercial orcharding idea that prevailed in Nebraska and some other Missouri valley states twenty-five to thirty years ago has been almost entirely obliterated, through a misconception or lack of understanding in what constitutes successful orcharding from a commercial, business and practical standpoint. Agriculture, which might be said to embody all features of soil tillage and land uses, has been wrongly interpreted by many of our pioneer settlers. The successful work of a practical or scientific horticulturalist in his efforts of growing and developing orchards, trees, plants and shrubs does not imply that the ignorant, unskilled, untutored in this line of industry can hope to meet with equal success, by merely planting the trees, giving them a little start in cultivation to direct them forward to maturity, then withdrawing all further attention and care and standing back to see the commercial reward in bowed-down trees—limbs breaking with their weight of fruits.

This picture, in brief, is the history of commercial orcharding in Nebraska. Away back in the 80's hundreds of commercial orchards were started in Nebraska, upon no other basis than the discovery that the soil and climate were peculiarly suited to the successful development of the fruit trees, that no other district of country could show a more vigorous, healthy, fine appearing growth of cultivated timber or tree of either fruit or forest variety than were then being grown on the prairie farm.

This encouraging aspect in tree production and the early bearing inclination of the various standard fruits, that had been tested by practical fruit growers, were the evidence then at hand for the future commercial orcharding industry. Upon this basis of cheap lands being quickly raised to a value of hundreds of dollars per acre, the planting of orchards began, and this feature of farm improvement was looked upon with favor by many as a source of revenue highly advantageous to the farm crop industry as well as a very positive enhancement to farm values.

Period of Disappointments.

As the commercial orchards came into bearing there was introduced a feature of business qualification that had not been studied, or, in fact, given any attention. The world had been expected to come forward, even to the orchard, in its anxiety and desire to get the fruit. It did not come, though in some instances fruit dealers did come and they bought

the crops on the trees at prices sufficiently low to guarantee picking, barreling, shipping, loss, etc., which did not leave the commercial orchardist enough to warrant him in calling it a commercial transaction. This period of disappointment was soon met by another. The insects whose efforts seemed to be centered in relieving the orchardist of any further trouble reduced the quality of fruit below the mercantile standard and the orchard ceased to be more than a pasture in many instances.

This history carries with it the majority of orchards comprising an acreage above that of the family orchard which is now a part of every well improved farm in the state. In traveling over the state it is a readily observed condition among the little family orchards, as well as those that were prompted in their planting by the commercial idea, that a very large per cent is neglected, in fact turned over to the merciful care of a divine providence to direct when they shall produce and what the quality or condition of the fruit shall be. The orchardist seemingly has surrendered all interest in this feature of farm improvement, except as a matter of reference when speaking of the farm as it may be offered for sale, "A large bearing orchard of so many acres, etc." And he should add, "of worm-producing fruits."

Neglect Is the Rule.

This neglect of the orchard, which is so universally found on the farm of the farmer, unless he perchance be of a horticultural tendency, taste and inclination to have every department of the farm improvement come up to a fixed standard, which he has cultivated and established in his methods of management, is the rule, not the exception. When the orchard is grown, when the trees are too big for the stock to injure by horning or rubbing down, it is practically turned loose to take care of itself. This would not be so fatal in results if the pruning and insect features of care were looked after. Here are introduced some matters of detail that "the get rich easy" orchardist had not figured into the account when he planned the enterprise. The orchard was to take care of itself after it was five or six years old, just like the old eastern orchard that produced great crops of fruit at random, except that this new western orchard on the rich prairie lands, would go on for a generation or so with its never-ceasing crop. The insect pests had not yet made their appearance, because there were no orchards, nothing for them to do.

Times Have Changed.

Times have changed in Nebraska within the last twenty-five years in the matter of fruit growing, tree planting, orchard cultivation and care. The horticulturist has adjusted himself to the conditions which surround him. He has not deserted the orchard and given it over to the codling moth, the scab, San Jose scale, etc., neither has he given up in

despair because the consumer does not come to the orchard for the fruit when it is ripe. On the contrary, this man has studied the conditions of trade in his particular line of production. He has based all his relations to the world, in this respect, upon supply and demand; he has employed business methods in his work of producing fruits; he realizes that he must meet the consumer half way; he must put his produce within easy reach of this class of people; he must co-operate with his fellow man in this work. He finds transportation facilities convenient and reasonable, and he finds commission men at the other end of the road ready and willing to handle his shipments and to hurry his produce on and into the hands of the consumer and all this assistance at a reasonable cost, when all things are considered.

The commercial orchard industry in Nebraska, handled under systematic, business methods in the care of the orchard, and the marketing of the product, is just as successful, just as permanent and abiding and just as remunerative as it is anywhere on the continent, when all features of the enterprise are considered. Cost of land, adaptability of soil and climate to all kinds of crop uses, cost of putting orchards into bearing, nearness to centralized markets, etc.

One Successful Orchardist.

As an illustration of what can be done in Nebraska, in commercial orcharding, we will review briefly what is being done in one particular orchard right in the center of a district in the state where commercial orchards have been planted and permitted to drift back into nonproduction. This orchard is known as the E. F. Stephens orchard of Crete, Neb., and has gained some notoriety by being associated with a big nursery industry carried on by Mr. Stephens for many years. This, however, does not necessarily give this orcharding enterprise any advantage over any other orchard in the state, similarly handled and managed for fruit production. The questions at issue and which we desire to bring out in this article are: Can commercial orcharding be made a success in Nebraska? Why are people skeptical as to their ability to grow fruit profitably in Nebraska?

It should be understood in the outstart with all persons who engage in any work or enterprise that there are obstacles and hindrances constantly coming up to check and interfere with one's plans and progress, and until we properly understand how to turn aside these interruptions we will be handicapped in our progress, but not necessarily defeated. Just so with the commercial orchardist in Nebraska; he has met the enemy and been able to conquer him. In the first place, the insect pest had to be headed off, exterminated, when established in the orchard. This Mr. Stephens, in the management of his orchard, has been able to do, and so perfectly has this work been carried out that in all this great orchard of more than eighty acres, after traveling miles through its broad avenues, up one row of apple trees and down another, closely

looking for an apple that showed a worm hole, there was not a single one came in view. Mr. Stephens' challenge was: "You can't find a wormy apple in the orchard." We came away without this seemingly rash assertion, when we knew that hundreds of orchards could not be found with scarcely an apple in them that did not have a worm hole to exhibit.

System of Spraying.

This condition of thrift and perfectness, freeness from blemish, is due to the system of spraying that is in use and practiced in this orchard. For more than twenty-four years Mr. Stephens has been spraying this orchard. His present system is to spray four times each season, thus not only exterminating any insect or fungus disease that may have had a lodging place, but completely heading off all attacks that may have been attempted. This was not a spasmodic attempt at killing off an enemy or reducing his fighting force and thus giving him an opportunity to recuperate, but it was a sure thing, a systematic onslaught that meant death to enemies of the orchard. It was this year and next year, year in and year out, for twenty-four years. It was a duty that became a habit. It was like eating three meals a day; it did not demand an exertion, scarcely a thought. This has resulted in the most perfect display of fruit that we have ever had the pleasure to witness in an orchard.

The accompanying treatment of this orchard which Mr. Stephens gives and which he says the one is useless without the other, in the preparation of the commercial orchard, is mulching of trees and cultivation of the ground between the tree rows. This work seems to be a plain, mechanical duty that is performed by spreading wheat straw in the tree row to about eight to ten feet in width and eight inches deep. The balance of the ground space, which means the vacant ground between the tree rows, is disced and harrowed until there is a fine soil mulch. This is kept in a nice state of cultivation throughout the summer season. At the time we visited this orchard, August 18, there had not been in that locality any rain for a month, or thereabout, yet the ground three inches below the surface, between the tree rows, would ball when dug up and squeezed in the hand. The ground under the straw mulch was moist, though not moist enough to ball when taken out even at twice the depth of that cultivated.

Three Important Points.

This illustrates three very important points which Mr. Stephens emphasizes as necessary for the successful growing of apples in Nebraska—spraying, mulching and cultivation to hold the moisture in the ground for use of the tree in fruit production. He is quite pronounced in his opinion of the necessity of adopting the smudge pot system of warding off the late spring frosts. With this addition to what he is already practicing, he believes the question of success with the commercial orchard in Ne-

braska is solved. The smudge pot to consume either coal or oil is now quite generally in use in the Colorado orchards as a late spring frost protection. They are used in numbers ranging from forty to eighty to the acre of trees and have proven satisfactory in raising the temperature sufficiently to ward off frost.

In interviewing Mr. Stephens as to the probable yield of his fruit crop this season he said: "Thirty carloads of fruit in sight to be marketed from the home orchards, thirty carloads to be marketed from the branch orchards, seventeen tons of grapes from the home vineyards, fine crop in sight in the W. E. Shearer (Kearney county) vineyard."

Co-operative Orchards.

In explanation, will say that Mr. Stephens' reference to branch orchards has to do with co-operative orchards located in various parts of western and northwestern Nebraska, where, in 1897, he conceived the idea of planting branch orchards with the purpose of eliminating the excessive freight charges. He satisfied himself by the growth of trees sent out to his customers that by making a suitable selection of hardy varieties adapted to western conditions, fruit could be grown in commercial quantities and thus supply the local markets of the west with fruit freed from excessive freight charges. Fifty thousand trees were planted under a joint expense and profit-sharing plan. The farmer improving his property by planting and cultivating a successful orchard and availing himself of the methods and close supervision and long experience of Mr. Stephens. When the fruit is ready to pick and market the expense of picking, packing, packages and marketing are jointly borne by each and resulting profits divided for a term of years.

Returning to the subject of production of the orchard, Mr. Stephens said: "The crop of apples in the orchard in 1891, eighteen years ago, was 13,000 bushels. At that time the younger orchards were not yet in bearing and the trees in other sections of the orchard were just coming into bearing. Comparing the orchard in previous years, in 1891 and in other years with its appearance this year, the probabilities are that the estimate for 1909 should not be far below that estimated by some expert authorities that have placed it at 15,000 to 18,000 bushels."

Yield of Single Trees.

In 1907 single trees of the Rawles Janet apple gave thirty bushels per tree. From 264 trees of this variety that season enough fruit was sold to pay the running expenses of handling the entire property. Single trees of the Ben Davis have yielded eight barrels. One Ben Davis tree, in age about thirty years, now has a spread of branches of some forty feet. These orchards have been handled on a plan of close planting and ultimately cutting out as trees needed more room. Under this method apple trees planted $12\frac{1}{2} \times 20$ feet have yielded for three years in succession at

the rate of 1,500 bushels per acre. The Winesap apple has yielded at the rate of 1,000 bushels per acre. From plats of the Duchess of Oldenburg sales have been made at the rate of more than \$600 per acre. The Utter, the Wealthy, the Duchess, the Cooper's Early White all have yielded large crops and have been found very profitable. The Wealthy are this season yielding at the rate of more than 1,000 bushels per acre. The Rawle's Janet promises this season to yield a larger crop than in 1907. The Ben Davis, the Winesap and the Missouri Pippin have set full crop.

The yield of the orchard in 1909 will be about 1,000 barrels of Rawle's Janet, 500 barrels of Winesap, 800 barrels of Ben Davis, 500 barrels of Missouri Pippin, 300 barrels of Utter's Red, 1,000 barrels of Wealthy, with more or less of other varieties, aggregating perhaps 13,000 to 16,000 bushels.

This orchard has been continually cultivated for thirty-seven years. During the winters of 1906-7 and 1907-8 about 3,000,000 pounds of manure were applied to the orchards and vineyards. In the last six years probably 1,000 loads of straw have been hauled in to use to mulch the row to the width of perhaps eight feet. The middles receive, as above stated, continuous cultivation.

Small Fruit Plantations.

There are five plantations of blackberries and raspberries. Since the blackberry and raspberry never bloom until very late they are not caught by the spring freeze. This idea stimulated increase planting and the plantations have been increased by the planting of about 10,000 plants in the spring of 1909. Annual heavy straw mulching takes the place of cultivation.

Some hundreds of trees have been planted in the plum orchards and many varieties have been tested. Among the more promising we note the Berwood. This variety was originated by the late Theodore Williams of Benson, Neb. This plum is a seedling of the Burbank and Brittlewood, the American Brittlewood giving increased hardihood, and the other parent giving size and quality. This variety is doing remarkably well this season over the entire state, clear up to the Wyoming line.

At the time of our visit Early Harvest, Red June, Sweet June, Yellow Transparent, Duchess, Cooper's Early White, Kirkbridge White and Saxton had already been marketed. Varieties next to run are the Day, Maiden Blush, Wealthy and Gravenstein. These will be followed by leading winter varieties—Grimes' Golden, Missouri Pippin, Winesap, Ben Davis and Rawle's Janet. All these varieties and many more are bearing abundantly and many trees are over-laden.

This orchard was established in 1871 by E. F. Stephens, who came to Crete direct from his old New England farm home in the state of Maine, with the intention of engaging in commercial orcharding. Before selecting the location Mr. Stephens visited the late ex-Governor Furnas, who in the '70s was one of the most prominent orchardists in

the state. As Governor Furnas had long been located on the bluffs of the Missouri river at Brownville he naturally appreciated the importance of elevated locations for orchards with contiguous lower levels into which the cold air of frosty nights could settle. Under the inspiration of this suggestion, 240 acres were purchased near Crete, located on the edge of the Blue river valley, mostly reaching up onto the divide between the Blue river and Salt creek. By special arrangement with the land department of the Burlington railroad it was agreed that 100 acres should be planted in orchard and timber, a concession in terms of payment being made by the Burlington favoring an enterprise of that character. Ground was broken the first season and twenty acres of orchard was planted the next spring. The 1,100 trees of this orchard were purchased of the late Samuel Barnard of Table Rock, then a prominent nurseryman of the state. Of these 1,100 apple trees planted on ground broken the preceding summer only five trees failed to grow.

From year to year additions were made to the orchard until eighty acres were planted, and about 120 acres, or half the tract, is now in orchard and timber.

Mr. Stephens has found his best markets in western and northwestern Nebraska and northwestern Kansas and eastern Wyoming. The summer fruits are shipped in barrel lots, the winter fruits usually in car lots.

There are four vineyards connected with the orchards. These have been very productive, the crop has never failed for a long period of years. The crop for this season is estimated at seventeen tons. The grape usually commences to ripen about August 20 to 25 and markets until about September 10. The grape is a hot weather plant and extreme heat of the present month is favorable to the vineyards.

THE "CAROLINA" OR "NORWAY POPLAR."

By Charles E. Bessey.

Several years ago I prepared a paper on the Carolina Poplar for the United States Forest Service, which was later somewhat revised and published about three years ago in the Annual Report of the Nebraska state board of Agriculture. On account of the widespread interest in this tree I may very properly reprint here the substance of that paper, making such revisions as will bring it down to the present state of our knowledge.

In the West, especially in the Mississippi valley, a tree has been largely advertised and sold under the name of Carolina Poplar. In some cases extravagant claims are made in regard to its good qualities, which, on the other hand, are strenuously denied by some tree growers. There has been a good deal of doubt, also, in regard to the specific identity of the tree, some holding it to be quite distinct from the common cottonwood, while others regard it as a mere variation or sport of that species, which has been propagated by cuttings from the staminate tree. In order to help to solve these questions, the following facts are presented:

Description of the Tree.

Leaves.—These are large, broadly heartshaped, prominently serrated with incurved teeth, the veins rather prominent on the under surface. The texture is firm, and both surfaces are quite smooth. The color of the foliage is a rich, dark, green, and the petioles, which are long and flattened, are more or less reddish, as is frequently, also, the midrib of the blade. On vigorous shoots the leaves are often five to seven inches long, four inches broad, and their petioles fully three inches long, while on less vigorous shoots, the leaves may be as small as three inches in length, three in breadth, and their slender petioles may be no more than two inches long.

Twigs.—More or less angled by narrow, corky ridges which extend downward from the center and sides of the leaves. Color when mature, light brown. The angles are much more prominent on very vigorous twigs, and may be almost wanting on those which are slow-growing.

Young Branches.—These eventually become smooth and round by the expansion and stretching of the bark as the branch increases in thickness. Color, light brown. This brownish color should serve to distinguish the Carolina Poplar from the common western cottonwood, on which the young branches ultimately become white.

Shape of Crown.—The crown or "top" of this tree is rather narrow

on account of the more erect growth of the branches. Left to themselves, the branches of the crown tend to grow upward somewhat as in the Lombardy Poplar, but by no means to such an extreme. Even when the top has been pruned back by having the terminal branches much shortened, it soon resumes its narrowed and somewhat compressed shape. This erect tendency of the branches and compact form of the crown in this tree, is in marked contrast to the common western cottonwood in which the branches are much more divergent, resulting in a markedly spreading crown.

Buds.—Much less gummy than in the common western cottonwood, but otherwise resembling them.

Trunk.—Darker colored (brownish) than in the common western cottonwood, in which the trunk is grayish.

Flowers.—Only the staminate ("male") flowers occur on the trees under observation. These are in elongated cylindrical clusters (catkins), which are compact at first, but eventually they elongate and become slender and drooping. When they first appear, they are purplish-red in color, but as they grow older, they fade into a dirty gray.

Rapidity of Growth.—Under cultivation, Caroline Poplar trees make a strong and vigorous growth, the shoots of a season often attaining a length of six to ten feet. Such shoots are nearly half an inch in thickness a little distance from the terminal bud, and are always very distinctly angled. This rapid growth of the young trees appears to be normal for the Carolina Poplar, since it occurs in all healthy trees. The same rapid growth, with consequent increase of size, and marked development of angles on the twigs, takes place in the common western cottonwood when sprouts spring up from the stump after the cutting of the tree, and it may well be that this similarity of the abnormal shoot of the one tree to the normal shoot of the other has contributed to the confusion as to their specific identity.

The Name "Carolina Poplar."

It is the opinion of some persons who have become interested in the question of the value of this tree that the name "Carolina Poplar" is of recent introduction, one correspondent going so far as to say that its use probably did not exceed twenty years, and that "the name has been given in order to defraud the people, by causing them to think they were getting something different from the cottonwood."

The earliest use of the name "Carolina Poplar" was by an English botanist, Aiton, in the first edition of the "Hortus Kewensis," published in 1789 under his original description of *Populus angulata*. In the second edition of this work, published in 1813, the description of *Populus angulata* is considerably improved, while the name Carolina Poplar is retained.

The name Carolina Poplar was used by Michaux, a French botanist

who made a special study of American trees, in "Histoire des Arbres Forestiers" in 1813, and in his "North American Sylva", which was first published in 1819, and in the later editions in 1842 and 1853, and later (1857). In both works and all editions, one of the poplars (**Populus angulata**), is described under the English name "Carolina Poplar", and it agrees in every respect with the tree we are now considering.

Decaisne and Naudin, also Frenchmen, in their "Manuel de l'Amateur des Jardins" (1866) describes **Populus angulata**, naming it the Carolina Poplar ("peuplier de la Caroline").

In Hemsley's "Handbook of Hardy Trees, Shrubs and Herbaceous Plants" (published in England in 1877) the name Carolina Poplar is applied to **Populus angulata**.

In the "Dendrologie," of Koch, an eminent German dendrologist, published in 1872, **Populus angulata** is called the "Carolinische Pappel" (Carolina Poplar), and this name is applied also to the variety **serotina**, which is known in the staminate form only.

In Koehne's "Deutsche Dendrologie" (1893) the work of another competent dendrologist, **Populus angulata** is called the "Karolinische Pappel" (Carolina Poplar), including also the variety **serotina**.

Bailey in his "Cyclopedia of American Horticulture," Vol. III, 1901, discusses the matter as follows: **Populus deltoides** var. **carolinensis**, Carolina Poplar. A very distinct tree in habit of growth, making a straight, upright or pyramidal head; leaves usually less distinctly deltoid, and more gradually taper pointed than **Populus deltoides**. Native. The Carolina Poplar is much planted, and nurseymen consider it to be distinct from the Cottonwood. It differs in strict, straight appearance, and it is a most vigorous grower. It is much planted in Europe, where it is known as the Swiss Poplar. Its botanical position needs to be investigated."

In Bailey's discussion, it must be remembered that when he speaks of the "Cottonwood" he is thinking of the eastern species, which differs from the Cottonwood of the Missouri Valley in sufficient degree to warrant their separation as distinct species. The Carolina Poplar does not resemble our western Cottonwood, but it does resemble the eastern species.

What Name Shall We Use.

From the foregoing it would seem very clear that the Carolina Poplar is to be called **Populus angulata**, and this was the practice of American botanists until about thirty years ago when Dr. Watson first suggested that the name might have to be dropped. Thus Michaux, Willdenow, Pursh, Eaton, Elliott, Gray, Wood, Wesmeal and Vasey all used the name **Populus angulata**. Latterly this species has generally been merged with the Eastern Cottonwood, but as shown above this is no doubt an error.

Now if we call the Carolina Poplar **Populus angulata**, what shall we call the Cottonwood? This question may be answered briefly, as follows:

The Eastern Cottonwood that we used to call **Populus monilifera**, is clearly the tree that Marshall first describes and named **Populus deltoidea** in the earliest book on American trees—his “*Arbustum Americanum*,” published in 1785, so this must be the name of the Eastern Cottonwood. Our Western Cottonwood has borne several names, but it seems now that the one which it will have to bear is **Populus sargentii**, a name given in honor of our greatest American student of trees. We may bring the matter together in this way:

Eastern Cottonwood—**Populus deltoidea**.

Carolina Poplar—**Populus angulata**.

Western Cottonwood—**Populus sargentii**. ..

The New Name “Norway Poplar.”

Several years ago we began to hear about the “Norway Poplar,” and I have repeatedly been asked as to its name and relationship. So a year or two ago I took up the matter and after a careful examination of specimens I found that they agreed perfectly with specimens of Carolina Poplar. I know that some of the nurserymen say that the root system is different and all that, but I suspect that this is merely one of the devices they have resorted to in order to sell their trees better. When I made the announcement to some of the people who have “Norway Poplars” for sale, they said that above ground the tree was apparently the same as the “Carolina Poplar” but that below ground, where I had not seen it, it was “very different”. I do not believe this at all. I am confident it is nothing but a trick of the trade and that we have here the same old Carolina Poplar, sold under another name. This of course, as everybody knows, is one of the oldest tricks for the sale of trees. When a thing has practically run its course under an old name the thing to do, the thing that is done, is to get up a new name and to push the old thing under this new name. And that is what has been done in this case.

I am sure from all I have seen of it that the “Norway Poplar” is nothing else than the “Carolina Poplar.” It has been given a new name for commercial purposes, the old name having worn out. Just notice that after a while when “Norway Poplar” wears out as “a name to conjure with,” the people who have such things for sale will get up another name, such as “Scotch poplar” perhaps, or possibly “Russian Poplar.” anything new and quite northern. If you want to make a hit you might call it the “North Pole Poplar,” “Greenland Poplar,” or Alaska Poplar.” It is very funny when you think of it how names are changed for commercial purposes, and how people will buy the old thing under the new name.

To sum up then:—The Norway Poplar is only another name for the Carolina Poplar, and must bear the old name of **Populus angulata**. Nor-

way or Carolina Poplar is distinct from the Western Cottonwood (*Populus sargentii*), and also from the Eastern Cottonwood (*Populus deltoides*, formerly known as (*Populus monilifera*).

And again, I cannot be certain of course that in all cases the trees offered for sale under the name "Norway Poplar" are the same. Until we have a law regarding the truthful naming of nursery stock, similar to the pure-food law which requires that articles of food shall be properly named, we can not control the naming of trees and shrubs. As it is at present a man may name his stock as he pleases, and the purchaser has very little legal protection. Of course he can enter suit in the courts, but with little chance of success.

I may close this paper by repeating what I said at the close of my paper three years ago.

Shall We Plant the Carolina Poplar for Shade?—In spite of the fact that it is said to be shorter-lived than the common Cottonwood, the Carolina Poplar can be recommended for planting where shade and protection are wanted in the shortest possible time. The fact that only the staminate trees are propagated assures planters that they will not be troubled by the disagreeable "cotton" which the pistillate trees of this genus produce.

Shall We Plant It for Fuel?—As in the foregoing question this may be answered safely in the affirmative where the quickest returns are desired. It must be remembered that this tree requires a good deal of moisture, and that it will not thrive on dry soil. For fuel it should be planted where it can obtain all the water it needs.

Shall We Plant It for Lumber?—From present information, the answer to this question should be negative. The common western cottonwood will produce a larger tree in a given time, and is apparently longer lived and free from borers, so that where lumber of this quality is desired, it will be wiser to plant the western cottonwood, *Populus sargentii*, rather than the Carolina Poplar, *P. angulata*, the latter including the so-called "Norway Poplar."

SWEET CLOVER, ETC.

By Charles E. Bessey.

So many inquire have come to me in regard to Sweet Clover and other clovers as to show that there is widespread interest in these plants. It has occurred to me that I might very properly reprint here the substance of some of the replies, which appeared originally in the **Breeders Gazette**.

Are They Weeds?

A correspondent sends the young shoots of the sweet clover. Since these have no flowers I cannot be absolutely certain as to which species this belongs, whether it is the white flowered one, or the yellow flowered one. However there is very little difference between the two, and it will make no difference in my suggestion as to whether the species is the **Melilotus alba**, or **Melilotus officinalis**. In either event the thing is a sweet clover and the habits are practically the same.

This is the plant about which a great deal has been written by many people, and in some parts of the United States the sentiment against it is so strong that it has been outlawed; that is, the plant has been made the subject of legislation, which requires that the plant be destroyed wherever found. The reason probably for this action against these plants is that they seed very freely, and plants spring up almost every place and in almost any kind of soil. Around Lincoln they may be found in fields, along roadsides, along the railway tracks and even in railroad yards. There seems to be no place where they will not grow. On this account many people regard them as weeds. However they are plants that have a number of valuable properties. In the first place they grow rapidly and yield a good forage. It is true that frequently cattle will prefer other green things in the spring, but there is no question as to the nutritious qualities of the plants for pasturage. Then later in the season if the plants are mowed down before they have become woody, they yield a hay which is very much like that produced by alfalfa, to which the sweet clovers are related. In the third place the sweet clovers have been noted for a long time as yielding good honey in considerable quantity. Many bee-keepers esteem the sweet clovers so highly that they purposely sow the seed in places where they can be allowed to grow. I have heard bee keepers tell of their surreptitiously sowing the road sides at night with sweet clover seed for the benefit of their bees.

So I should say that unless it has become an actual nuisance otherwise, it will pay to allow it to grow, especially if a man is engaged in growing bees.

Good Bee Pasturage.

The plant referred to is one of the sweet clovers. This could have been told by smelling the plant, especially when partially dried. The very sweet odor is what has given the plants the name of sweet clover. The sweet clovers belong to the genus *Melilotus*, and are all plants of considerable importance. They grow very easily and so have been called weeds by a good many people, but it has been shown that many of them are valuable forage plants, and it has also been known for a long time. that they are very valuable for yielding honey to the bee grower.

There are two common species of sweet clover growing in this country, namely, the yellow sweet clover (*Melilotus officinalis*), and white sweet clover (*Melilotus alba*). They are both originally from Europe, but they are hardy plants and have spread westward across the country. In some states the law makers some years ago passed laws requiring that these plants should be cut out wherever found and so they are outlawed, but I have never felt that this was right. The sweet clovers may be made very useful on the farm if properly grown. In the first place they are among the best of the clover-like plants for enriching the soil. Their little root tubercles are well known nitrogen collectors and there is no reason why nitrogen might not be added to the soil by the growth of these plants. In the second place when the plants have grown a foot or so in height they can be plowed under and the soil greatly enriched in this way. And in the third place when the plants are pretty well grown, but not yet hard and woody, they make a good hay, and lastly their flowers yield an abundance of **most excellent honey**.

Yellow Sweet Clover.

The yellow sweet clover is known botanically as *Melilotus officinalis*. It is a native of the old world and has been brought to this country by people who like it for various purposes. It is a very sweet-scented, honey-bearing plant and the bee keepers like it very much on this account, as it furnishes a large amount of very good honey. In many parts of the country the bee keepers sow it along roadsides and elsewhere in order that their bees may have the honey to collect for the hives. For some reason some farmers have a great prejudice against this sweet clover. Probably the principal reason is that it grows up in a voluntary way and frequently forms great patches. Cattle do not care to eat it when it is green, although they will do so to some extent when it is cut and made into hay. For hay it should be cut before it gets to be too large and rank, as then the stems are too big to utilize. I never have shared in the general denunciations of the sweet clover that has been indulged in by some people, and yet I can see that it may become a nuisance in some places. I should advise people in regions where there is much sweet clover to grow bees in great numbers.

Buffalo Clover.

The very pretty and striking clover sent by another correspondent

is what has been known in the West as Buffalo Clover. I have no idea whatever as to why it was called Buffalo Clover. Its scientific name is **Trifolium reflexum**, and it is often found wild in Nebraska. It looks when growing, much like common red clover, and has leaves and heads of about the same size. The plants are a little more hairy than most of the red clover and the heads have this peculiarity that when they have blossomed the individual flowers bend down and turn brown in color. This brown color is a beautiful chestnut and adds much to the appearance of the clover. In fact it is these brown heads that one sees, and in this way the plants are seen and attention is called to them. The plants are mostly annual, sometimes, however, living for a greater length of time and becoming perennial for short periods. While there is nothing harmful in this clover, it has never yet been regarded as of sufficient importance to be brought under ordinary cultivation. It is sometimes grown as a curiosity and is interesting from this standpoint, but for pasture or forage it has not been looked upon as of sufficient importance to warrant anyone in attempting to cultivate it.

Three Other Clovers.

The one with rather large, long heads, which are silky hairy is what is known as the Rabbit-foot Clover. Its scientific name is **Trifolium arvense**. It is a rather common species in Nebraska, and has on the one hand no bad qualities, while on the other it has no especially good qualities to commend it. It is sometimes grown, but is really not of enough importance to be brought under common cultivation. It is a native of Europe and has come in along with the seeds of other plants.

The second species is also a wild clover. It has cup-like growth at the back of the little heads and this distinguishes this species from the ordinary clovers. I know of no common name for that one and it is known in science as **Trifolium cyathiferum**. Like the one above it has no bad qualities, but on the other hand has very little to commend it. It is a wild thing which occasionally comes into cultivated grounds.

The third species is the Low Hop Clover. It has very small yellow flowers and after these have bloomed the flowers turn brown and remain on the heads, spreading out rather widely. The scientific name of this one is **Trifolium procumbens**, and is very common in Nebraska. This has been very commonly regarded as a harmless weed and probably it is such. It is a native of Europe, and has come to this country in the seeds of other and more important plants.

Every one may rest assured that he does not have anything to fear in these three clovers. They will be eaten somewhat by cattle and other animals, and they constitute a good forage as far as they go. As I said, however, they are not of sufficient importance to be regarded as forage plants of any great value.

ABOUT DODDER.

By Charles E. Bessey.

So much has been said recently about Dodder in the agricultural press that it will be helpful if some of the replies to the inquiries that have come to me are given here essentially as they first appeared in the **Breeders Gazette**.

Dodder is a small climbing flowering plant, botanically very nearly related to the morning glories. The theory upon which we explain the dodder is that some morning-glory-like plant ages ago took to the habit of stealing food from the plants on which it climbed. Everybody knows that wild morning-glories climb over all sorts of other plants, twining round them very tightly. Now it is not a very difficult thing to understand that a plant under such circumstances might rather easily send a little root into the plant around which it is twining, and then the trouble would begin. Once the plant learned how to steal food in this way I imagine that it would be about as it is with a human being who gets the habit of stealing chickens, corn and other things from his neighbors. At any rate the dodder is structurally like a morning-glory. Its little flowers are really morning-glory flowers, very small it is true, and the little pods are quite like the pods of the morning-glories. The only difference between the dodder and the morning-glories is that the dodder has no leaves, and yet if you will look very closely you will find that there are vestiges of leaves, and the theory here again is that since the dodder has become a parasite it does not need any leaves, and through disuse they have disappeared. When the dodder seeds fall to the ground they germinate very much as ordinary seeds do, and the tiny root which appears pushes into the ground and fastens itself there quite after the fashion of ordinary roots. At the same time the upper part of the plant is twining around such vegetation as it may be able to reach, and if in its reaching after other plants it finds a plant which it likes well enough it sinks its little roots into it and begins to absorb through them rather than through the root which is in the ground. This little root in the ground now being neglected and of no importance to the plant, dries up and from that time on the dodder lives wholly as a parasite.

My correspondent is quite right when he suggests that if the dodder has no root in the ground it can be eradicated much more readily. That is quite true. Moreover nearly all the dodder plants die when winter comes, unless in the extreme south, where some of the plants may live over; in fact it is found that occasionally in the north a dodder plant which has attacked itself very near to the ground may

live over until the next year. Ordinarily, however, this does not take place, and so if every dodder plant in the field is killed and it produces no seeds the field will be rid of the pest.

Dodder in Clover.

The specimen which one correspondent sends is that of the Clover Dodder, and it shows that he has a difficult problem on his hands. For many years in the United States the clover was entirely free from the Dodder, although it was badly affected in many parts of Europe. Something like fifteen or twenty years ago the dodder began to appear in the United States in considerable numbers and its increase has been quite rapid, until now there is probably not a state in the Union where the clover is not more or less troubled with it.

The dodder is a flowering plant closely related to the morning-glory and like the morning-glory it twines around whatever it reaches. The morning-glory, however, when it starts from the seed sends its root into the ground and begins to gather nourishment from the soil, while the dodder allows its root to die very soon after it gets a start. In fact, the root of the dodder is used only long enough to give it a little start, and when the vine has begun to twist itself around the clover it loses its own root, and from that time on it allows itself to live entirely on the clover from which it sucks out the food matter it needs. If my correspondent will examine a fresh specimen, he will find that where the dodder twists around the clover stem, it sends in little suckers by means of which it steals nourishment from the clover.

He need not be afraid that there is any poison in this dodder plant. It does not hurt the hay, although I suspect it does not add to its value in any way. However I imagine that it is very necessary he get rid of it because it will spread, otherwise, throughout his whole farm, and make it impossible for him to grow clover with success. For this reason the stock should not eat hay filled with this dodder because the seeds, which are much smaller than clover seeds, will be scattered in this way all over the farm.

The only thing that can be done to get rid of this pest is to mow out the patches affected and when they are dry to burn them. In this way the seeds would be burned. This should be done as soon as the dodder appears in the field.

Dodder Is Increasing.

It is interesting to notice that specimens of dodders in clovers and alfalfas are coming in more and more every year. Twenty-five years ago clover dodder was almost wholly unknown, and I was very much astonished once in Iowa about that long ago to have specimens sent to me from the southern part of the state. They were, however, not of the species which a later correspondent sends. This appears to be the genuine

European clover dodder, the one that has made so much trouble to the growers of clovers and alfalfa (Lucern) in that country.

Whenever Clover Dodder is found in a field, it must be cut out as soon as it appears. The owner should go into his field with a sickle or perhaps a scythe and cut out carefully every bit of the clover that is affected with the Dodder. This should then be put into a bag and carried out of the field where it should be burned. The latter precaution is desirable because the seeds otherwise would ripen and there would be the danger of propagation of the plant in this way. There should be every effort made by farmers to keep out this Clover Dodder and it can be done only by careful weeding out from every field. It is easy to see it and with a sharp hand-sickle a man could go over a large field in a short time.

It may be well to state that Dodder is propagated by seeds which are a little smaller than clover seeds, so small that they are commonly found in clover seed that has been grown in a field affected with Dodder. There is no question but that this Clover Dodder was brought to this country as an impurity in Clover seed and this is an additional reason why greater care should be taken in requiring seedsmen to sell only clean, pure seed.

In reply to still another inquirer I may say in the first place that the seedsman who sold the alfalfa seed filled with dodder should be very severely condemned, and he ought to make some proper recompense. I do not know what the seed laws are in the various states, but they should be such as to protect the buyer against such contamination as seems to have been the case in the instance referred to.

Now as to what to do for the field which has been injured by the growth of the dodder. It must be remembered that dodder is a tender annual, and dies out, at least for the most part, at the end of the year and before the winter sets in. It is true that in some instances dodder has been found to live over down near the root of the alfalfa or clover plant but it is agreed that this is not commonly the case. So if the owner can keep the dodder from producing any seeds he will eventually rid his field of it. The proper thing to do will be for him to watch the field and as soon as any dodder appears to have it cut out entirely and burned. It should say that a trusty boy provided with a sickle and a bag would be able to go over a very considerable field very carefully in a short time. I should send the boy over the field every few days with instructions to cut out and put into the bag every bit of dodder which he finds. It should be remembered that the dodder has no roots of its own in the ground. When the seeds first germinate they send a tiny root into the ground for a long enough time to enable the little plants to live until they have fastened themselves to the alfalfa stem, then the root portion of the dodder dies away and after that it has no connection with the ground. So when the boy is hunting for dodder he need not be afraid that any roots will be left in the ground.

THE USE OF ANNUAL FLOWERING PLANTS FOR DECORATING PRIVATE GROUNDS.

By V. V. Westgate, University of Nebraska.

After a man has built his house and other necessary buildings, it is advisable for him to turn his attention toward beautifying the grounds about these buildings, in order that the entire effect of his premises will be as beautiful as possible. Grass seed has to be sown and trees and ornamental shrubs planted. In order for these plantings to be well executed, it is very necessary that a plan of the grounds be made, which will show where each tree or group of shrubs should be placed. All good houses are built according to a plan which an architect has designed. The ground planting should likewise, although with less exactness, conform to a definite idea or plan. Each tree or shrub should be so located, in order that it will not hinder a good view to or from the house, when it becomes full grown. Many other ideas have to be worked out or otherwise the grounds, as a whole, can never be as effective as they would have been if properly mapped out.

Of course, it seems very natural that the more permanent a thing is to be, the greater care should be taken in selecting a place for it. For this reason, it is not as important that one be as exact in planting annual flowers, which grow to maturity, bloom and die in a single season, as for plants that survive for many years. If the planting of annuals does not suit the taste of a person one year, he can change the style, somewhat, the following year. We may consider that the lawn, trees and shrubs form a relatively unchangeable frame work, whereas the annual flowering plants give the trimming that may be altered every year, if so desired.

But, nevertheless, there are certain rules which have to be observed in order to be successful in arranging and growing annual flowers. In the first place, never place a flower bed of annuals, or any other kind of flowers, in the center of a good lawn, for the lawn itself is not only injured by it but the scenic effect of that portion of the grounds is lessened. A nice lawn, when properly tended, gives a much finer setting to a place than any number of flowers. The bulk of annual flowering plants should be placed in the background or along the shrubbery border. If used in beds, locate the beds near to one side of the lawn or in the rear. Most annual flowers, however, are not so effective when placed in formal beds because of their straggly habit. In choosing such flowers for bedding purpose, we should decide on those which are neither too straggly nor too formal. A gaudy carpet or design bed should never be used for decorating private grounds. Such things are in reality freaks and should

be placed in botanical museums. Some annual vines, such as the morning-glory and moonflower, are very good for covering porches and especially unsightly objects, as dead tree trunks, dilapidated outbuildings, etc.

If one wishes to grow annuals in a flower garden, he should plant, cultivate and tend them like a vegetable garden and the blooms should be picked from them every day, after they commence to flower. This method of growing cut flowers is quite another thing, however, from the idea of having flowering plants, for the purpose of decorating the grounds.

In making the groups of annual flowering plants for the border, always place the tall growing kinds in the rear, in front of the taller shrubs or trees. Low growing plants should be next to the border edge and the medium tall plants ought to be planted between the largest and smallest ones. By this method we will obtain the best view and finest effect when the flowers bloom. But as we are grouping the plants according to their heights, we must also arrange them so that the colors of their flowers will harmonize. The mixing of dull colors can be exercised with considerable freedom, but bright colored flowers need to be arranged with greater care. Brilliant colors, which contrast too strongly, may spoil an otherwise good effect. White makes a good contrast with a great number of colors and consequently one finds a great many white flowers used in annual plantings. I have found in experimenting with annual flowers, that they have a wide range of characteristics. Some are hardy and bloom profusely the whole season, almost regardless of moisture, whereas others are killed by the first dry spell. Some like a sandy and other prefer a clay soil. There are a few kinds which I would especially recommend because they are so well adapted to our soils and climatic conditions and bloom during the entire summer. Among tall growing plants for the background, few are any better than hollyhocks and castor beans. The hollyhocks, with their large flowers are very showy. The blossoms of the castor beans are not very noticeable, but their tropical-like foliage is excellent. Balsams, marigolds, phloxes and zinnias give us wide range of colors for selecting medium tall growers. The zinnias have large composite flowers and an extremely long season to bloom. If I were to recommend a single annual flower as the best under all conditions, I would choose the zinia. For edging the border, sweet alyssum, ageratum, mignonette and portulacae are well adapted. The first two are used to the greatest extent. There are many other good annual flowers, but these are some especially recommended for planting, if the conditions are adverse.

After one has made the plans for planting and selected his seed, the next thing to be considered is the method of planting. It is a very good plan to scatter a liberal quantity of well rotted manure over the bed, during winter. This should be scattered evenly over the surface so that it can be well mixed in the spring. After the frost has left the

soil, give the ground a thorough spading by digging down eight to ten inches. Turn the soil over, when you spade it and break up the lumps as you go, in order that they may not bake. Pulverize the surface thoroughly by using a common garden rake, and it is then ready for the seed sowing, providing the soil and air are warm enough. If the soil is too cold, the seeds may not germinate well and even if they do, they may be killed by an early spring frost. In planting the seed, they should be scattered rather profusely over the soil surface, for it is better to have too many than not enough as many of them may not grow. Cover the seed by raking them into the soil. Such a covering should be no thicker than outside conditions demand. Although we have many strong winds and heavy rains in the spring, it seems to me that an eighth of an inch cover is sufficient for nearly all such seeds. It is usually unnecessary to water the seed bed artificially, but in case the surface becomes too dry before the seeds germinate it may be a good plan to give the soil a thorough soaking. After the plants are up well, thin them out in case they are too thick. One or two hoeings, in order to stir the surface soil and kill the weeds, comprises about all the necessary tending and in a few weeks the flower border is one mass of bloom.

There are other methods of starting the flower seeds if one has the room and the means to perform them. Such seeds do best if started in hotbeds, very early, and then transplanted later to the flower borders. This gives earlier and stockier plants, but is quite expensive and hence not often practiced. Many people start such seeds in flats or boxes, indoor and then transplant them. This is very good and does not necessitate the expense of constructing hotbeds. But using either method of planting, the owner will find that these beautiful annual flowers fully repay him for the trouble he has taken to raise them.

HORTICULTURE IN MINNESOTA.

C. S. Harrison, York.

No state in the union has had greater difficulties to overcome than Minnesota, and no class of men have won more sublime victories along the horticultural line. Every defeat was a challenge which was heartily taken up until victory followed victory, and now this northern state has the best, the largest and most enthusiastic society in the United States, if not in the world. Just think of it, the membership is now over 2,800 and will soon reach 3,000. From beginning to the end the different programs were carried out without a hitch. Secretary Latham had all the machinery well oiled.

The first paper was on the Ponderosa, or bull pine, by the president of the Nebraska Park and Forest society, who is also a life member of the Minnesota society. He gave his experience of twenty-five years with this remarkable tree, showing its adaption to the great west and northwest. He showed how the farmer could raise these trees in the open as easily as he can onions, he gave the experience of an ordinary farmer in Manitoba who raised 3,000 from one-half pound of seed at the initial cost of 50 cents per 1,000. He had samples with him showing the necessity of transplanting when a year old, thus securing a mass of fibrous roots.

He also spoke of the by-products of this tree. Several establishments in California and Oregon are distilling a valuable oil from the needles, which is used in making soap and also cough candies. Fiber yarn is also made from them, so when you plant a rapid growing bull pine grove you plant a flock of sheep, which, instead of needing care, will take care of you, it will cost nothing to winter them and you know where they are nights. He hoped that in a few years members would come to the meetings wearing overcoats of their own growing.

A. B. Coleman gave an interesting paper on raising small fruits on the pine lands of northern Minnesota. The discussion following showed that this portion of the state was producing enormous crops of splendid berries. Walter A. Yatmke gave an account of his remarkable success with the Homer Cherry in the southwestern portion of the state. Discussion developed the fact that cherries had not been successfully grown north of St. Paul. In the afternoon the general subject of evergreens was conducted by former president, Clarence Wedge of Albert Lea. He brought in quite a number of specimen trees of his own growth. Mr. Wedge has had special success along this line. In the discussion, the fact was brought out that every failure of Rocky mountain evergreens in Minnesota has been traced to the fact that the seeds had been gathered

from the foot hills, instead of the high altitudes of the Rockies. It was a matter of congratulation that this year, there were no seeds in the lower altitudes on account of the late frosts, but all that were gathered, were from the highest points, so that the plants are very all over the north.

The meeting was turned over to the Rose society under the able leadership of Mrs. D. C. Ruff of St. Paul. Mrs. Ruff is a practical, enthusiastic florist, and carries off first premiums at most of the flower shows. Her husband gave a most glowing description of the modern Dahlia, giving it a place of such supreme importance, that all other flowers must hide their heads in its august presence, "God bless the man with a fad, if it is only a worthy."

The modern Dahlia is a glory, see what a diversity of forms and beauty has come from that little single flower of the long ago, and new varieties are constantly being produced. It is all right if one has time to care for it, but it needs a great deal of care. Give us the replendent peony which takes care of itself.

The meeting was greatly enlivened by the presence of Dr. H. M. Speechley of Pilot Mound, Manitoba, who came as a representative of the society of that province, the doctor is a lover of nature—a poet, and an enthusiastic florist. Of course he gave us a paper of superior merit. A man of his force, vivacity, and enthusiasm would cheer up the coldest region of the continent, and I doubt not flowers will spring up in his.

The evening of December 2, the great annual banquet was held when everything broke loose and there was "sense and nonsense, toasts and sweets, the feast of the season and the flow of soul," but no "flowing bowl." This is the great annual unbend after a strenuous season of toil when a year of relaxation is packed in a few hours of fun. Wednesday morning the Plant Breeders' Association held a very spirited meeting. Great enthusiasm is developed in the production of iron-clad apples and hundreds of promising seedlings are coming to the front. The world's leading pomologist, Charles G. Patten of Charles City, Iowa, was there. A man who wears his seventy-six years with the suppleness of youth and says he must live to be one hundred in order to complete his work.

The Nebraska Horticultural society is exclusively devoted to horticulture. The Minnesota society has as its auxiliaries, The Rose society, Plant Breeders' auxiliary, Bee Keepers' Society, Women's auxiliary, conducted by the brightest women in the state. Then comes the forestry association, which, instead of being pushed to one side is welcomed and fostered and given a prominent place. The annual report which is prepared with great care gives a complete report of all these auxiliaries. They are members of the great horticultural society. By their generous and cordial treatment the scope of the society is greatly enlarged and instead of pears, plums, apples and peaches, and then peaches, apples plums, peaches and pears, the kindly arms of the society reach out and gather in both the useful and the beautiful, so it has grown

to be the greatest society on earth. Each sub-organization has its officers who carry out their own programs at a specified time, and the whole is fitted together so that there is no hitch, misunderstanding or delay. Minnesota has quite a number of experiment stations; a new one has just been taken on at Paynesville, Minn., under the care of Frank Brown. This station is making a great success with raising evergreens, ornamental, peonies and perennials. It is one of the farthest north in the United States, and its work is looked upon with much interest and it is an off-shoot of the select nursery of York, Nebraska.

Top working apples had an important place in the discussion. After years of careful experimenting, it was found that even tender varieties, like Grimes' Golden and Jonathan would do as well north of their own belt. The hardiness of the stock seemed to impart hardiness to the scion. One man grafted a lot of Melinda's on Dutchess' with remarkable results. He secured enormous crops and the fruit was much larger. He considered every tree thus worked worth \$20 each, certainly a good price, considering the first cost. In many sections the Virginia crab was used for a stock and in regions farther north the Hibernial was a favorite. The discussion certainly opened a wide range of possibilities. The meeting closed with a good house and intense interest to the end. Two-minute speeches were called for from the members and delegates and there was a rattling of fireworks for one-half hour as wits and congratulations were shot forth. All together it was a harmonious and delightful meeting. The cause of the remarkable success seems to lie in the fact that the society has leaders of superior ability and a harmonious executive board. They take time to deliberate; they lead and the members follow. There are a few men like Secretary Latham, who is quiet, but wise, and sends out an influence which is felt all through the state. The society very much needs a building of its own, and in the near future we trust it may secure one.

THE PRODUCTION OF POTATO SEED TUBERS BY MULCHING.

Report of the Committee on Vegetables.

By R. A. Emerson.

There is a general impression among the potato growers of Nebraska, particularly among those of the southern part of the state, that it is an advantage to secure seed tubers from the North at least once every two or three years. In other words, many potato growers believe that the potato deteriorates when grown in southern Nebraska from the same stock of seed year after year. Experiments carried on at the Nebraska Experiment Station, as well as experiments reported from other places, indicate that there is a basis for this belief. About five years ago the Experiment Station secured some Early Ohio potatoes from the Red River country of Minnesota, a region which has the reputation of producing very good seed stock. This same stock of Early Ohio has been grown at the Experiment Station every year since. Two or three times since getting this original stock we have brought in Red Ohios for comparison. During the past three or four years, the potatoe stocks direct from the Red River country have yielded decidedly better than the Experiment Station stock, which, as noted above, came originally from the Red River country. In other words, the Red River stock seems to have deteriorated by being grown in the vicinity of Lincoln for a few years.

The explanation commonly offered by potato experts to account for such deterioration as that noted above when potatoes are grown in the South is something like this. The potato is naturally a cool weather plant. It is supposed to have been native in the high plateaus of South and Central America. In these regions, while the days are hot the nights are invariably cool, owing to the elevation. Similar conditions are approached in the northern States of this country. It is certainly true that the potato succeeds better in the cooler climate of the Northern States than it does in the warm climate of the extreme Southern States. It is certainly also true that the hottest part of the day is of shorter duration in the North and that the nights are distinctly cooler. It is also true that the soil temperatures are in general lower and doubtless more uniform in the North.

Some years ago it occurred to me that if northern-grown seed was better than home-grown for the reasons noted above, we might be able to grow seed tubers in this region successfully by imitating more northern temperature conditions. This might be accomplished in part, it was thought, by very deep planting, so that the tubers, forming somewhat deeper in the ground, would be subjected to lower and more uniform tem-

peratures. This method has not been found entirely practical, however. Tubers that form deep in the ground are much more difficult to dig without injury. It was thought that possibly hilling up the rows with soil at the last cultivation, as used to be practiced with potatoes, might be an advantage in the same way; but it has been known for a long time that, while hilling up may be good in itself, it is impossible to produce a ridge about the potato plants without getting the dirt from the middle of the rows, and in doing this a large number of potato roots are cut and the yield is likely to suffer materially. The only other method of accomplishing what was desired that has suggested itself to me is the use of a mulch of straw, old hay, or other coarse material. This litter mulch can be spread over the surface of the ground, either before the plants come up or after they have reached considerable size. It has been found that a straw mulch four inches deep after settling keeps the soil temperature a few inches under it almost constant from day to night and constant within a few degrees from week to week during the summer. On the whole, also, the average soil temperature is considerably lower under the mulch than when bare. The temperature of the air immediately above the mulch, however, fluctuates much more decidedly than it does above bare ground. It is not uncommon to get temperatures from three to five degrees lower at night just above the surface of a mulch than just above the surface of bare ground similarly located. During the hottest part of the day, on the other hand, the temperature immediately above the mulch reaches a point from three to five degrees higher than that above bare ground in the same situation. Potatoes grown by means of a straw mulch then have their roots and the tubers subjected to rather low and very uniform temperatures and their tops to high and particularly to extremely variable temperatures. The mulch, except in protracted dry periods, retains moisture in the soil better than ordinary cultivation, so that the plant has the advantage of a higher percentage of moisture and a more uniform moisture content.

Under these conditions of temperature and moisture, potatoes grown at the Experiment Station have yielded on the average fully as good crops as when given good cultivation. It is true that in certain cases the yield has been lessened materially, particularly where the stand has been hurt by applying the mulch too deep before the plants came up or by planting the seed tubers too deep so that the plants have lost vitality in pushing up through both the soil and the straw. Where the stand has not been hurt—and it is not usually hurt if the mulch is applied carefully, and never hurt if the mulch is applied after the plants are well up—the yield has been fully as good as where the best cultivation was given. Mulching with coarse stable manure has often increased the yield quite noticeably. The important thing from the standpoint of this paper, however, is the effect of the mulch upon the crop the following year. In every case this effect has been a favorable one. To show that the test was carried on fairly, it may perhaps be well to outline it in some detail.

Some five or six years ago, when the stock of Early Ohio potatoes mentioned in the early part of this paper was obtained from the Red River country, the tubers were planted in the ordinary way on as uniform soil as could be obtained. Later, one-half of the ground planted to this lot of potatoes was mulched with straw and the other half received cultivation throughout the summer. In the Fall the potatoes from the two plats were dug at the same time, placed in sacks, and kept under the same conditions in a root cellar during the winter. The next spring the two lots were planted on adjoining plats of uniform land, and both plats were given the same cultivation throughout the season. The only different between the two plats, then, was that the seed for one of them had been grown the preceding year under a mulch while the seed for the other had been grown by the ordinary methods of cultivation. When the two plats were harvested it was found that the plat where the mulched seed had been used had yielded about forty per cent more than the adjoining plat, where cultivated seed had been planted. The test has been repeated every year since with the original stock of Early Ohio potatoes. Some of the potatoes grown under the mulch one year are mulched the following year and some cultivated, and some of the potatoes grown by cultivation one year are mulched the next year and some of them cultivated. In addition to continuing the tests with this original lot of potatoes, new stocks of potatoes have been brought in at various times. In each case uniform potatoes are planted, a part of the ground mulched and part cultivated, the crop harvested and kept under identical conditions over winter, planted on adjoining plats the next year, and given uniform treatment, ordinarily by cultivation, the following summer, just as was done with the original stock of potatoes. In none of these tests has the cultivated seed given better yields than the mulched seed of the same stock. The mulched stock of any lot has never given less than fifteen percent increase in yield over the cultivated lot of the same stock. The average increase in yield due to mulched seed, considering all the tests running over five years, has been something over thirty per cent.

It would seem that the experiment has been carried on with sufficient care and that it had been carried on sufficiently long so that we can now say with considerable assurance that the increase in yield observed from the use of mulched seed has been due to the better condition under which the seed tubers were grown the preceding year. It being settled that mulching potatoes one year makes stronger seed for the next season, the question arises as to whether this method can be used on the farms of this state. It is probably impossible for the large potato grower to grow sufficient seed under a mulch to plant his fields the following season, but it does seem perfectly feasible for the ordinary farmer who grows only an acre or two, or not more than five or ten acres at the most, to grow sufficient seed under a mulch for his whole crop. We have found that the labor required to haul straw or hay where the stack is not too far from the potato field and apply it evenly over the surface of the ground is just about equivalent to the time spent in four or five thorough

cultivations which the potato crop should receive if it is to amount to much. On many farms there is a surplus of straw or old hay from the tops and bottoms of stacks which could be used for this purpose, so that the cost of the material need not be considered. Less labor is required to spread the mulch before the potatoes come up, but a better stand is secured by waiting until after the plants are well up and placing the straw carefully about them. It is usually necessary to rake off the greater part of the straw before digging the potatoes, which of course adds materially to the expense of this method of growing them. One advantage from the standpoint of the labor which mulching has over cultivation is that it can be done at one time and no further attention need be given the patch so far as tillage is concerned during the season. If a large area were to be mulched, it would be impossible to do this except when the ground is fairly dry, since loads of straw could not be hauled onto the field when wet. In case of the ordinary farmer, who will wish to mulch only a small area, he can mulch say two or three rows along the side of his field. The mulch for these rows can be spread from the driveway at the side of the field without driving the wagon onto the potatoes at all. Under these conditions a day can be taken for spreading the mulch when the ground is too wet for cultivation either in the potato field or elsewhere, so that in reality very little time will be lost from the other work.

Even though it were somewhat more expensive to grow the seed tubers by mulching than by cultivation, which is not the case ordinarily, it would pay to use this method of seed production. If the yield of the whole field next year can be increased as much as ten or fifteen per cent—and this is less than half the average increase which we have secured at the Experiment Station—it would pay certainly for any added expense in producing the seed under a mulch. For the average farmer, therefore, it would seem better to grow seed tubers at home under a litter mulch of some sort than to use homegrown seed produced in the ordinary way, and also better than to depend upon buying Northern seed. For the large potato grower, who can go north and select his own seed from suitable soils of who can deal directly with some reliable potato grower in whom he has confidence, the northern seed will doubtless remain the best; but the general farmer who grows a small area of potatoes cannot always know, when he buys northern seed, what locality the seed came from, what type of soil it was grown on, or in some cases whether it was grown in the North at all. Potatoes grown in the North on sandy soil are not supposed to be as good for seed as potatoes grown on heavier soils. potatoes grown in the North by a careless grower, not well cared for, so that the plants did not mature properly, cannot make as good seed as potatoes grown by a careful grower. In conclusion, then, I would recommend to the man who is to grow a small area of potatoes to try producing his seed tubers at home under a little mulch. At the Experiment Station this has given very satisfactory results, even better results, in fact, than we have secured from seed brought in directly from reliable growers in the North.

SCIENCE'S WARFARE ON FRUIT TREE PESTS

Spraying Department, Conducted by Prof. E. P. Taylor, State Entomologist of Missouri.

Spraying for Codling Moth and Curculio.

All doubt as to the value of spraying for the control of injurious insect and fungus life in the fruit orchards has been removed from the dullest minds, and dwarfed, knotty and wormy fruit has now come to be a reproach upon both the intelligence and industry of the grower. He must obey the law of the universe and adapt himself to the conditions of environment, and his evolution from the thriftless, profitless, unthinking plodder to the brilliantly successful orchardist is fully indicated by the character of the fruit he places on the markets. There is no reasonable excuse for stung and deformed fruit except failure to carry out plans of spraying which are already well known to be effective. Throughout Missouri and the mid-west states there is a strong tendency to more careful and intelligent spraying. The summary of the results of spraying experiments conducted by the Missouri State Fruit Experiment station for the control of the codling moth and curculio, given herewith, will be of real value to all orchardists, for these pests are widely spread and their destructive habits are felt wherever the apple and other fruits are grown.

One of the main objects of the spraying experiment conducted was to determine the dates of spraying most suitable as a combined treatment against curculio and codling moth. Many entomologists have shown by experiment how it is possible to proceed in controlling the codling moth without reference to the curculio. The remarkably successful results of apple growers in the Rocky Mountain, Pacific and north-western states, in controlling codling moth are based upon methods aimed at this insect alone, since the curculio is not destructive if all present in those sections. Missouri and mid-west fruit growers must, however, make an allowance for an additional and equally important factor—the curculio. There have been, upon the other hand, some very effective plans of sprays advised by entomologists, after experimental trials, to be used on apples with curculio principally in view. Since both insects have always to be dealt with in Mississippi valley orchards it seemed that the problem was worthy of further study in perfecting sprays serving both purposes.

The orchard spraying problem in Missouri, like many of the mid-west states, is further complicated by the prevalence of several fungous diseases, most prominent of these being apple scab and bitter-rot. In the experiments of the writer these were taken into consideration and insofar as they have bearing upon the sprays for the two insects under discussion they are summarized herewith, in condensed form, easily comprehended and assimilated:

Summary of Experiments

The plum curculio and the codling moth are the most destructive insects to the apple crop in Missouri and the mid-west. The financial loss from these two pests in a year when an average crop is borne amounts to millions of dollars.

The plum curculio is the small, grayish, snout-beetle well known to orchardists, which injures the apple by making small round holes through the skin in feeding and by making the half-moon shaped marks upon the surface of the fruit in egg-laying. There is but a single annual generation. They hibernate in the winter as adult beetles and appear in the orchard shortly after the blooming of the fruit. Sometimes the beetles feed sparingly upon the foliage, eating small holes from the leaves. From the time apples measure one-third of an inch in diameter to when they reach the size of walnuts the maximum number of both food and egg punctures are being made. If not destroyed early in the season the beetles will continue to puncture the fruit and to produce a new generation. Apples punctured by curculio may fall to the ground as windfalls or if left upon the tree may be so badly stung, gnarled and deformed as to be unfit for market.

The codling moth is the parent of the "apple worm." It and its work, the "wormy apple," are already too familiar to orchardists. Fruit growers should know when each transformation of the insect takes place throughout the year. Apple growers spray against both curculio and codling moth, modifying their scheme of treatment for the fungous diseases which have also to be combatted.

A practical spraying experiment was conducted in 1909 upon a block of about twenty acres of Ingram apples in a large commercial Ozark apple orchard for the purposes of showing the best kind of spray, the proper time to spray and the best way to spray apples to prevent codling moth and curculio injury. Three early sprays resulted in 97.6 per cent picked apples free from curculio crescents while 45.5 per cent were damaged on the trees unsprayed. Three early sprays resulted in 99.83 per cent picked apples free from codling moth worm holes, 14.5 per cent being wormy from codling moth on the trees unsprayed. There were 97.4 per cent picked apples free from both kinds of injuries when sprayed three times while unsprayed trees gave only 46.1 per cent free from such blemishes. The three early sprays, by preventing windfalls, gave 45 per cent more picked apples than the unsprayed trees. When the fruit from the sprayed and unsprayed parts of the orchard was graded, injuries from both insects and fungi being considered, and sold it was found that the spraying had doubled the cash returns from the crop. After deducting the cost of spraying a net profit by virtue of the sprays amounting to \$65.36 per acre, was secured. For every dollar expended for spraying \$7 were saved in the price secured for the fruit. The profits accruing, though yield of trees was light, was sufficient upon a twenty-acre tract to pay in one year for a \$300 gasoline power spray outfit and leave more than a thousand dollars clear gain besides.

A spray of the standard Bordeaux mixture just before blooming, in addition to the sprays after blooming, will be necessary to prevent apple scab.

After the petals fall, but before the calyx cups close, apply a drenching spray of arsenate of lead, using two pounds to fifty gallons. This is the first curculio and codling moth spray, and is the most important of all sprays used against the codling moth. Every calyx cup should be filled to the brim. In ten days to two weeks after this apply a mist spray of arsenate of lead with a weak Bordeaux mixture. This should be to coat the little apples and the leaves. It will be before the codling moth eggs are laid but will be when many curculios are feeding. In ten days or two weeks following apply another mist spray of arsenate of lead with weak Bordeaux mixture, coating over apples and leaves. This will be when curculios are abundant. Apples will measure three-fourths to one and a half inches in diameter.

In orchards where codling moth damage has been very severe and curculio injury light, the spray, given ten days or two weeks after petals fall, should be omitted and the third sprays applied about six weeks after the petals fall. The maximum number of codling moth worms are then entering. Three early sprays, as recommended, if thoroughly applied, will be sufficient to control both codling moth and curculio under average conditions in the middle-west.

A guaranteed brand of arsenate of lead is the best insecticide for apple spraying. Homemade arsenate of lead is preferred by some growers. Paris green is not quite as effective as arsenate of lead, and though used with every precaution often damages the apples by causing blackened areas about the blossom end. In the long run arsenate of lead is the cheaper spray.

Thoroughness of spraying is the greatest essential. The spray given after the petals fall should be through a coarse nozzle at a high pressure and the liquid shot squarely into the calyx cups. Later sprays should be given as a mist, but should coat every apple and leaf with poison. Whether the spray outfit be a barrel pump or a gasoline power outfit, buy only the best. Good spraying can only be done with good spray outfits and enough of them on each orchard to complete the spraying at the proper time.

Spraying is the principal operation in controlling codling moth and curculio in apple orchards. There are other operations, such as mid-summer cultivation, destruction of windfalls, thinning of wormy fruit, etc., which have an important influence.

Plant Lice and Their Remedies

The following information is condensed from Bulletin No. 134, issued by the Colorado State Fruit Experiment station, and is the joint work of Prof. C. P. Gillette of the Colorado station, and Professor Taylor of the Missouri station.

The plant lice that are commonly designated as "aphids" have very

similar habits, structures and remedies. These should be known and understood by the farmer and fruit grower who have to contend with them. Nearly all of these lice are rather easily destroyed when proper remedies are intelligently applied to them.

General Structure and Habits

All of the plant lice get their food by inserting a beak and sucking the sap of the plant. They never eat away the tissue of the leaf.

Throughout the entire summer, from spring to about the first of September, all of our plant lice that infest orchard trees, increase in numbers by giving birth to living young. If eggs are laid at all they are deposited by the last brood of females in the fall. From the fact that a single louse is usually able to give birth to from seventy-five to 150 young, and as they mature in about eight to ten days after being born, it will readily be seen that the plant lice are capable of increasing with wonderful rapidity. This accounts for the fact that the lice may nearly all be killed from a tree and that tree be very seriously infested with the lice again within a few weeks. Usually the last brood in the fall are about one-half males and one-half females. These females deposit the eggs that live over winter and the lice all die. We have an exception of this rule, however, in case of the wooly apple aphid, which lives over winter as young or partly grown lice upon the trunk of branches, and in all stages of growth upon the roots of the trees.

Plant louse eggs usually hatch in the spring a little before the leaf buds begin to open on the trees that they infest. These early lice hatching from the eggs are always wingless in the species mentioned in this bulletin, and are called stem-mothers. These stem-mothers mature in a short time, are all females, and begin giving birth to young lice which constitute the second brood. It is seldom that the second brood of lice have more than a very few winged ones. The remainder of the life history of these lice will be given under the different species treated.

Apple Plant Lice—Wooly Apple Aphid

It is a bark feeder, and it attacks both the roots, the trunk and the limbs of the trees, but does not feed upon the fruit or foliage. This louse is readily recognized on account of its being covered with a white woolly secretion which has suggested its common name. Upon the trunk and branches the lice attack either the tender bark about the scars or the bark of tender new shoots. Below ground, the lice attack the bark of the smaller roots, causing warty swelling upon them. If very abundant, the roots are often completely covered with these smooth wart-like growths which sometimes cause the roots to die and rot off. When very abundant upon the very rapidly growing twigs, these lice often produce abrupt swellings due to the thickening of the inner bark. Sometimes these swollen portions of the limbs crack open lengthwise and the

limbs may be sufficiently injured to cause them to die. Severest injury is done to the tops where there is the tenderest and most rapid growth as in grafts and water sprouts.

Prevention

Prevention is nearly always better than the cure. Great care should be taken, therefore, when setting out a new orchard, to prevent the introduction of this louse. Orchards are usually infested by the lice that are upon the roots of the nursery trees when they are set out. All nursery stock should be thoroughly disinfected either by fumigation with hydrocyanic acid gas, or by very thorough spraying of the trees, both roots and branches, before they are set, with one of the remedies mentioned below for spraying tops.

If nursery stock is received with roots, "puddled," covered with mud, the purchaser should insist upon this mud being thoroughly washed off, and the roots treated for woolly aphis, as this is one of the methods that the nurseryman has of covering up woolly aphis upon his nursery stock.

To prevent the spread of the woolly aphis from tree to tree and orchard to orchard, the lice should be well cleaned out of the orchard before the first week of September, as it is about this time when the winged lice begin to fly about to spread the species.

Remedies Above Ground

Wherever this louse can be reached by sprays it may be destroyed like other plant lice, but one precaution is necessary, the spray must be applied with sufficient force to remove or penetrate the woolly covering. There are several spray materials that we have found entirely successful when thoroughly applied to this insect.

Kerosene Emulsion.—According to our experience, a good kerosene emulsion has no superior for the destruction of this insect. It seems to penetrate the woolly covering rather better than most other insecticides. When used in the ordinary strength (one-fifteenth oil) we have always found it efficient. In the proportion of one-twentieth oil (5 per cent), we have usually found it sufficiently strong if applied with a good deal of force and thoroughness. To be most successful, apply as a moderately coarse spray and with a pressure, if possible, of 140 or 180 pounds.

Soaps.—We have found the standard whale-oil soaps, such as "Good's Whale Oil Soap" and "Bowker's Tree Soap" quite effectual for the destruction of this louse when used in the proportion of one pound of soap to each six or eight gallons of water.

Black Leaf.—The Kentucky Tobacco Product company of Louisville, Ky., manufactures a tobacco extract which they sell under the above trade name, and which has become very popular among the orchardists of Delta county, Colo., as a spray for orchard plant lice. We have tested it quite thoroughly and have found it very efficient for the woolly aphis

if used in the proportion of one gallon of the Black Leaf in sixty-five to seventy gallons of water. In fact, we have usually been successful when using Black Leaf as weak as one gallon to 100 gallons of water. This strength, however, requires very thorough application. It would be a good plan for anyone to treat a few trees with varying strengths of this or any other insecticide for the destruction of lice a day or two before taking up his general spraying work, for the purpose of determining whether or not the strength that he contemplates using is sufficient to kill the lice. In this way he may save many dollars, from using the insecticides in a strength that will not do the work or in a proportion unnecessarily strong.

Tobacco Decoction.—If any prefer to make their own tobacco decoctions, they may use tobacco stems or tobacco dust or whole leaf tobacco. Fruit men, however, have not reported very uniform results from their own preparations. This may be due to adulterations in the tobacco or from different methods of preparing the decoction. For the preparation of tobacco decoctions see under Preparation of Insecticides, below.

Lime-Sulphur Sprays.—The lime-sulphur sprays have not been successful in destroying the woolly aphid during the summer season when the body is covered with the woolly secretion. It has been fairly successful when applied two or three weeks before the buds open for the destruction of the little lice that live over winter upon the trees and which do not have their bodies protected by the secretion.

Late Winter or Early Spring Work

So far, the remedies mentioned have been for summer treatment, when the bodies of the lice are more or less covered with the waxy secretion. We believe the best time to get results in the treatment of this louse is late in the winter or early in spring before the buds open. This is not because the lice get protection from the opening buds, but because by the time the buds have opened, the lice have their bodies more or less covered by the waxy secretions that protect them to some extent from the effects of the insecticides.

Orchards in the Grand valley, Colorado, treated early in the spring of 1907 for the destruction of the eggs of the green-apple aphid were also largely freed from the woolly aphid. The insecticides that were found successful in the destruction of these little overwinter lice were: Lime fifteen pounds, sulphur fifteen pounds, water thirty gallons. Lime fifteen pounds, sulphur fifteen pounds, water forty-five gallons. Rex lime-sulphur one gallon, water seven gallons, lump lime two pounds.

Lime fifteen pounds, sulphur fifteen pounds and water sixty gallons was a little weak and did not give results that were fully satisfactory, and the same was true of Rex one gallon, water seven gallons, without the addition of lime.

Treatment Below Ground

The treatment below ground is all aimed at the lice that are within

three feet of the crown of the tree and within one foot of the surface. It should also be remembered that the same substances that will kill lice above ground will also kill them below ground if they can only be put in contact with the lice, and then the orchardist should be cautious not to accumulate in the soil about the crowns of his trees substances that are likely either presently or after years of repetition, to do his trees an injury.

Conclusions As To Best Treatment

Just before the buds open in the spring, spray very thoroughly with a 7 per cent kerosene emulsion, a one to sixty Black Leaf dip (or some other strong tobacco decoction), or a good whale-oil soap, one pound to six gallons of water. Spray the entire trunk and also the ground about the crown of the tree at the same time. Immediately after treatment apply a Tanglefoot band over cotton so as to prevent the upward migration. If the lice become very numerous at any time upon the tops, spray them forcefully with the 7 per cent emulsion, or Black Leaf, one part in seventy parts of water.

Root treatments are temporary in their effects. When the roots become very badly infested, treat as above described with 10 per cent kerosene emulsion, Black Leaf dip (one to fifty), two to three gallons to a tree, or if soil is quite open and porous, carbon bisulfide.

The Green Apple Aphis

This is the common green louse curling the leaves of the apple tree in Colorado. While primarily a leaf feeder this louse attacks the tender tips on growing shoots, especially grafts and water spouts. This insect ranks close to the woolly aphis in extent of injuries to the apple trees. It also attacks the pear, the thorn and the quince quite freely.

Life History

This louse remains upon the apple, or closely allied trees, throughout the year and does not go upon other trees or vegetables. The first lice in the spring hatch from eggs that were deposited the previous fall upon the twigs of the trees. These first lice hatch a few days before the buds open and are ready to insert their sharp beaks into the first tender green tissue of the opening buds. These lice are all females and become fully grown in about two or three weeks, when they begin giving birth to living young. From this time on the lice increase very rapidly if they are not kept down by their natural enemies or the insecticides of the orchardist.

At first all the lice are wingless, but the 10th to the 15th of May in the warmer portions of the state, and about two weeks later in the cooler orchard sections, the winged lice begin to appear and to fly from tree to tree and orchard to orchard with the prevailing winds. About the first week in September little brown wingless males and green wingless egg-laying females will appear, and a little later the females

will begin laying green eggs that soon turn black upon the apple twigs. The freezing nights in November or early December kill all the lice and the eggs live over to hatch the following spring.

Remedies

Treatment for this insect may be for the destruction of the eggs and young lice before the buds open in the spring, or for the destruction of the lice upon the leaves during the growing season.

Kerosene emulsion in all our experiments has proven useless for the destruction of the eggs except when applied so strong as to make it entirely impractical to use it.

The Lime-Sulphur Mixtures.—Either the 1-1-2 or the 1-1-3 formula, or Rex lime-sulphur in dilutions down to one gallon in eight gallons of water, have given good results. Lime-sulphur by the 1-1-4 formula is a little weak for good results.

Black Leaf.—This preparation used in the proportion of one gallon in twenty-five, and one gallon in thirty-three of water gave good results, but one gallon in forty gallons of water was not very satisfactory, many of the eggs hatching.

Summer Spraying

For the destruction of the lice upon the leaves spray very thoroughly and forcefully from all directions with kerosene emulsion, 5 to 7 per cent oil; Black Leaf, one part in seventy part of water, remembering that thorough and forceful applications are necessary in order to get best results. [National Horticulturist.]

CANNING VEGETABLES IN THE HOME

J. F. Breazeale, Bureau of Chemistry, Washington, D. C.

The first step in successful canning is the selection and preparation of the vegetables. Never attempt to can any vegetable that has matured and commenced to harden or one that has begun to decay. As a general rule young vegetables the superior in flavor and texture to the more mature ones. This is especially true of string beans, okra, and asparagus. Vegetables are better if gathered in the early morning while the dew is still on them. If it is impossible to can them immediately, do not allow them to wither, but put them in cold water or in a cold, damp place and keep them crisp until you are ready for them. Do your canning in a well-swept and well-dusted room. This will tend to reduce the number of spores floating about and lessen the chances of inoculation.

In the following directions are given for canning some of the more common vegetables, but the housewife can add to these at will. The principle of sterilization is the same for all meats, fruits, and vegetables.

Corn

Contrary to the general opinion, corn is one of the easiest vegetables to can. The United States Department of Agriculture has shown that the amount of sugar in the sweet varieties diminishes very rapidly after the ear is pulled from the stalk; therefore in order to retain the original sweetness and flavor it is necessary to can corn very soon after it is pulled—within an hour if possible. Select the ears with full grains before they have begun to harden, as this is the period of greatest sugar content. Husk them and brush the silks off with a stiff brush. Shear off the grains with a sharp knife and pack the jar full. Add salt to taste, usually about a teaspoonful to the quart is sufficient, and fill up the jar to the top with cold water. Put the rubber ring around the neck of the jar and place the glass top on loosely. Be careful not to press down the spring at the side of the jar.

Place the false bottom in the boiler and put in as many jars as the boiler will conveniently hold. Don't try to crowd them in. Leave space between them. Pour in about 3 inches of cold water, or just enough to form steam and to prevent the boiler from going dry during the boiling. It is not necessary to have the water up to the neck of the jars, as the steam will do the cooking. Put the cover on the boiler and set it on the stove. Bring the water to a boil and keep it boiling one hour. At the end of that time remove the cover of the boiler and allow the steam to escape. Press down the spring at the side of the jar. This clamps on

the top and will prevent any outside air from entering. The jars can now be removed and cooled or allowed to stand in the boiler until the next day.

On the second day raise the spring at the side of the jar. This will relieve any pressure from steam that might accumulate inside the jar during the second cooking. Place the jars again in the boiler and boil for one hour. Clamp on the top as on the preceding day and allow them to cool. Repeat this operation on the third day. In removing the jars from the boiler be careful not to expose them to a draft of cold air while they are hot, as a sudden change in temperature is likely to crack them.

After the sterilization is complete the jars may be set aside for a day or two and then tested. This is done by releasing the spring at the side and picking up the jar by the top. If there has been the least bit of decomposition, or if sterilization has not been complete the top will come off. This is because the pressure on the top has been relieved by the gas formed by the bacteria. In this case it is always best to empty out the corn and fill up the jar with a fresh supply. If canning fruits or some expensive vegetable, however, examine the contents of the jar and, if the decomposition has not gone far enough to injure the flavor, place it once more in the boiler and sterilize over again. If the top does not come off, you may feel sure that the vegetable is keeping.

Bacteria are very resistant to heat. They thrive in products like milk and in meats and vegetables rich in protein, such as peas, beans, etc. All known species of molds require air in which to work. This is not true of bacteria, certain species of which will live and cause vegetables to decompose even when no air is present. When these particular species are present the exclusion of air is no safeguard against decay, unless the vegetable is first thoroughly sterilized. Bacteria are so small that they can only be seen with a microscope, and they reproduce themselves with amazing rapidity. One bacterium under favorable conditions will produce about twenty millions in the course of twenty-four hours. Accordingly, certain vegetables spoil more rapidly than others because they furnish a better medium for bacterial growth.

The reproduction of bacteria is brought about by one or two processes. The germ either divides itself into two parts, making two bacteria where one existed before, or else produces itself by means of spores. These spores may be compared with seeds of an ordinary plant, and they present the chief difficulty in canning vegetables. While the parent bacteria may be readily killed at the temperature of boiling water, the seeds retain their vitality for a long time even at that temperature, and upon cooling will germinate, and the newly formed bacteria will begin their destructive work. Therefore it is necessary, in order to completely sterilize a vegetable, to heat it to boiling point of water and keep it at that temperature for about an hour, upon two or three successive days or else keep it at the temperature of boiling water for a long period of time—about five hours. The process of boiling upon successive days is the

one that is always employed in scientific work and is much to be preferred. The boiling on the first day kills all the molds and practically all of the bacteria, but does not kill the spores or seeds.

As soon as the jar cools these seeds germinate and a fresh crop of bacteria begin work upon the vegetables. The boiling upon the second day kills this crop of bacteria before they have had time to develop spores. The boiling upon the third day is not always necessary, but is advisable in order to be sure that the sterilization is complete. Among scientists this is called fractional sterilization, and this principle constitutes the whole secret of canning. If the housewife will only bear this in mind she will be able with a little ingenuity to can any meat, fruit, or vegetable.

String Beans

Select young and tender beans string them and break them into short lengths. Pack firmly in the jar, cover with cold water, and add a teaspoon of salt to each quart. Put on the rubber and top and boil for one hour on each of three successive days, as directed under "Corn." A small pod of red pepper placed in the bottom of the jar will give a delightful flavor to this vegetable.

Eggplant

Pare the eggplant, cut in thin slices, and drop in boiling water for fifteen or twenty minutes. Drain off the water and pack the slices in the jar. Cover with water and sterilize as directed under "Corn." The slices of eggplant are pliable and may be taken from the jar without being broken and either fried in bread crumbs or made into pudding and baked.

Beets

Although beets will keep in the cellar over winter, it is very desirable to can them while they are young and tender, as the mature beet is apt to be stringy and lacking in flavor. Wash the young beets cut off the tops, and put them in boiling water for about an hour and a half, or until they are thoroughly cooked. Take off the skins, cut in thin slices, and pack into the jars. Cover with water and sterilize in the manner previously described. If a mild pickle is desired, make a mixture of equal parts of water and good vinegar, sweeten to taste, and cover the beets with this mixture instead of water.

Okra or Gumbo

This is a vegetable worthy of more extended culture. Although extensively grown in the South, it is comparatively unknown in the North. It is easily kept and makes a delicious vegetable for the winter. Wash the young and tender pods, cut them in short lengths, pack in the jars, cover with water, and sterilize. Okra is used for soup or stews.

Summer Squash

Cut the vegetable into small blocks, pack in the jars, and cover with water. Add a teaspoon of salt to each quart and sterilize. It is sometimes preferable with this vegetable, however, to pare off the skin, boil or steam until thoroughly done, mash them, and then pack in the jars and sterilize. If canned in the latter way, it is advisable to steam for an hour and a half, instead of for an hour, on each of three days, as the heat penetrates the jar very slowly. It is absolutely necessary that the interior of the jar should reach the temperature of boiling water. A jar will usually hold about twice as much of the uncooked.

English Peas

When prepared and canned in the proper way, peas are easily kept and never lose the delicate flavor that they possess when fresh. Shell the young peas, pack in jars, and sterilize as directed under "Corn."

Asparagus

Can the young tips only, in the same way as you would corn.

Cauliflower

This vegetable usually keeps very well, but if the supply for the winter should begin to spoil it may be necessary to can it during the summer. Prepare it as you would for the table, pack it into jars, and sterilize.

Carrots and Parsnips

These, if gathered during the early summer and canned, make most excellent vegetables for the winter. The young plants at that season are not stringy and have not yet developed the strong taste that is so objectional to some people. Prepare as you would for the table, and sterilize.

Tomatoes

Every housewife knows how to can tomatoes. They are very easily kept, even in the common screwtop Mason jar. If one already has on hand a number of jars of this pattern, it is best to use them for preserves or for canning tomatoes and to purchase the more modern styles for canning other vegetables. In using the Mason jars be careful to sterilize them first by placing in cold water, bring to a boil, and boiling for about ten minutes. The rubber and top should also be immersed in boiling water for the same length of time. Remove them from the boiling water when needed, handling as little as possible. Be careful not to put the fingers on the inside of the top or the inner edge of the rubber. Fill the jar with the cooked tomatoes while steaming hot, put on the rubber, screw on the top firmly, invert it, and let it stand in that position until cool.

Kohl-Rabi

This vegetable resembles the turnip in its habits of growth, although in flavor it more nearly approaches the cauliflower. It is grown in many sections of the North, but in the South it is almost unknown. Prepare it as you would turnips, pack in the jar, and sterilize.

Lima Beans

Lima beans lose their flavor very quickly after being shelled; therefore it is necessary to can them as soon as possible after gathering. Discard all pods that have begun to harden, and proceed as you would with corn.

Pumpkin or Winter Squash

If provided with a warm, dry cellar, one may keep certain varieties of these vegetables all winter. Some of the best varieties, however, do not keep well, and even the best keepers when not properly housed begin to decay in December or January. It is then necessary to can them in order to save them. If one has a limited number of jars, it is a good plan to fill them all with other vegetables during the summer and upon the approach of frost to gather pumpkins and bring them indoors. By the time the pumpkins begin to spoil, enough jars will be emptied to hold them. They can now be steamed and canned in the same way as summer squash. In this way a supply of jars may be made to do double service.

Succotash

The writer has found that a mixture of corn and lima beans, or succotash, is one of the most difficult things to keep. This furnishes one of the very best mediums for bacterial growth; so extreme care must be taken in the process of canning. It is advisable to gather the corn and beans early in the morning and prepare and sterilize them in the manner already described. As with summer squash, it is best to boil for an hour and a half, instead of for an hour.

Vegetable Roast

A rather unusual dish for the winter may be made by canning a mixture of vegetables. Prepare corn, lima beans, tomatoes, string beans, orka, squash, and eggplant as you would for canning separately. Mix these in varying proportions, letting the corn and lima beans predominate. Add two or three medium-sized onions to each quart of this mixture and run all through a food chopper in order to mix it thoroughly. Pack into jars and sterilize. In preparing for the table with an equal volume of bread crumbs, a piece of butter the size of a walnut, and one egg; season to taste with pepper and salt, and bake in a round baking dish until brown. Cut into slices as you would a cake and serve hot with a drawn butter sauce.

Corn, okra and tomatoes, mixed, equal proportions, may be canned in this way as a soup stock.

Freshness of Flavor and Color

Vegetables when canned properly should retain their attractive color and lose very little of their flavor. It will be found almost impossible to detect any difference either in taste or in appearance between the canned and the fresh article if these directions are carefully followed. The volatile oils which give flavor to most vegetables are not lost during this process of sterilization. Cooking for three short periods in a closed container at a comparatively low temperature instead of cooking for short periods at a high temperature or for one long period in an open vessel makes the vital difference and insures freshness of flavor and color. After the jars have been sterilized and tested, they should be kept in the dark, as the sunlight will soon destroy the color of the vegetable.

How To Open a Jar

Jars of vegetables are sometimes hard to open, unless it is done in just the right way. Run a thin knife blade under the rubber, next to the jar, and press against it firmly. This will usually let in enough air to release the pressure on the top. In case it does not, place the jar in a deep saucepan of cold water, bring to a boil, and keep it boiling for a few minutes. The jar will then open easily.

Cautions

These directions for canning apply only to pint and quart jars. If half-gallon jars are used, always increase the time of boiling, making it an hour and a half instead of one hour.

Do not go into canning too deeply at first. Experiment with a few jars in the early part of the season and see if they keep well. It is not a difficult matter to can vegetables properly. The writer has never lost a can of string beans, okra, eggplant, carrots, parsnips, lima beans, beets, asparagus, or pumpkin in several years' experience, and has had only one can of peas spoil, a few cans of corn during the earlier trials, and a few cans of succotash. Any housewife can do equally well. If you follow the directions here given carefully, you will have no difficulty whatever. If you should happen to fail in the first trial, rest assured that you have done something wrong or left something undone. No housewife who has on hand during the winter a supply of home-canned vegetables ready to serve on ten minutes' notice will ever regret the trouble or difficulties experienced in learning. [Fruitman and Gardner.]

THE GRAPE BLACK-ROT AND ITS CONTROL

By Prof. Lorenz Greene, Iowa State College, Horticultural Department

Most grape-growers in the vicinity of Council Bluffs and other localities in the Missouri valley are considering the question of whether or not they shall spray their grapes this year. Many of them have already purchased materials and machinery for this purpose. Some growers have not as yet been troubled with the rot and are loth to go to the expense of spraying until there is more evidence for the necessity. If they are located at some distance from infested vineyards, they will probably not be troubled for a season or two. But it must be remembered that many of the growers who have suffered severe losses the last year were not troubled prior to two years ago, and many had never seen the rot in their vineyards before. The rot can be kept under control much easier if taken in hand early than if allowed to gain a strong foothold in the vineyard it requires two years' spraying before the most profitable results can be secured.

Therefore, it seems that the better method will be for the extensive grower to spray his vineyard whether he has been troubled with rot or not.

Several mixtures have been recommended for use in black-rot control, but Bordeaux mixture is at present the one most universally used. The United States government and one or two of the state experiment stations recommended the use of five pounds of copper sulphate and five pounds of lime to fifty gallons of water. Weaker solutions have been found good, but until further evidence of their efficiency is secured it will be best to use this formula.

Lime sulphur, both commercially and home prepared, have excellent results. The self-boiled mixtures are also used. If the commercial brands are used after the dormant season they should not be used in stronger solutions than one part of the mixture to fifty parts water, as even this solution burned the foliage in some of the government work last year. Weaker solutions will be tried by different experimenters this year.

In applying these mixtures there will be a tendency on the part of the growers to feel that they can control the rot by driving the sprayer on only one side of the row. The machine should pass both sides of every row. If the opposite side of the vine is examined after the sprayer passes, it will be found that it has not been thoroughly covered. These unprotected places will serve as a propagating-bed for the disease, which will spread to other parts of the vine. Thoroughness will be the safeguard.

After the blossom buds are formed, or in the spraying just as the blossom buds open and those thereafter, it has been found most profitable to use two leads of hose behind the spray-machine and apply the spray directly to the bunches by hand. This is an added expense, but as above stated, it has proven profitable.

There is some difference of opinion as to the proper time to spray for the most efficient control at the least cost. Many advocate a dormant spray and two other sprayings before the blossoms open, while others contend that such early sprayings are unnecessary. The time for the dormant spray is past, but a spray applied at any time before the blossoms open can do no harm and will, no doubt, prove of value. The most important sprayings are those applied just as the earliest blossoms open and the next after the blossoms have fallen. Following these, two more sprayings at two or three weeks' intervals should be made to protect the growing berries. Possibly a fifth spray should be applied, depending somewhat on the season. As Bordeaux mixture discolors the fruit, this should be the ammonia and copper-carbonate solution which will leave no color on the fruit.

Directions for mixing these sprays will be found in Iowa Bulletin No. 89, which can be secured by writing the Director of the Agricultural Experiment Station, Ames, Iowa. [National Horticulturist.]

HOW TO PLANT A TREE TO SECURE BEST RESULTS

By Prof. W. N. Hutt, Horticulturist North Carolina Department
of Agriculture

It is not every man who can properly plant a tree. That this is true is evidenced by orchard and shade trees all over the country. One can scarcely take an hour's drive in any farming community without seeing trees that are suffering from improper handling at planting time. From my observations I think it safe that 50 per cent of the trees sent out from nurseries never come to usefulness. This great loss is due to careless and unintelligent handling rather than to any other cause.

Delicate Structure of Trees

In the first place, trees are not the non-destructible organisms one would be led to think they were, from the way one so often sees them handled. On the contrary, trees are made up of delicate organs, which are very subject to adverse conditions, and, like other living forms, readily show the result of favorable or harmful environments.

The part of a tree above ground, because it is always subject to changing conditions of weather, has acquired the power of accommodating itself to a considerable range of conditions. Hardy trees can resist and accommodate themselves to a very wide range of temperatures. The root environment of a tree is of a very different nature from the conditions above ground. The more dense nature of the soil covering about the roots of trees makes them less susceptible to sudden changes than the air-exposed parts. For this reason, the roots are much more tender and easily injured than the branches of a tree. Branches cannot endure root environment, nor can roots endure branch environment—and yet we often see trees exposed at planting time, as if the roots would stand whatever the tops would.

Root-Hairs

In addition to these conditions of environment, roots have delicate organs, known as root-hairs, that maintain their life only under conditions of moisture. These root-hairs, as their name implies, are fine and hair-like—so fine, indeed, that one needs a microscope to see them perfectly. They have exceedingly thin and delicate cell-walls, and contain the active protoplasm on which the life of the tree depends. It is by the osmotic action of the delicate walls of the root-hairs that the tree is able to get its food from the soil. As might be seen from their nature, root-hairs are very easily injured and killed by drying. Unless they are constantly in contact with moist soil particles, they die, and the leaves of the tree above the ground quickly tell of the loss below the surface.

When root-hairs are exposed to the air they at once begin to lose moisture and as the moisture dries away, their vitality diminishes proportionately. It is upon these delicate little organs that the life of a tree depends, and its growth and vigor is proportionate to their activity and numbers. Yet one would scarcely believe that there was anything delicate about the roots of trees, to see the way they are exposed by some planters.

Heeling-in and Covering

From the time trees leave the nursery row until they are permanently planted, they should be exposed just as little as possible. They should never be left open to sun or wind or air, when it can at all be avoided. Trees should not be laid out while holes are dug, nor under ordinary circumstances should those for a whole row be laid out at one time. Trees waiting for planting should be heeled-in with moist earth about the roots, and only taken out of the ground when actually needed for setting. To save time when planting, trees may be placed in a wagon and covered with wet straw or fertilizer sacks. As the planting proceeds, the trees can be taken singly from the wagon as wanted. This treatment just outlined stands in striking contrast to the plan, or lack of plan, where tree roots are exposed for hours to the injurious effects of the sun and wind. Moreover, the success as shown by vigorous living trees will stand in striking contrast to the results of the planting where trees are not carefully covered.

Transplanting Seedlings

If a tree could be taken out of the ground without the loss of root-hairs, it could be transplanted without dropping a leaf. If it were planted in as good a soil as that from which it was taken, the tree would never know that it has been transplanted. The loss of trees in transplanting is largely in proportion to the loss of root-hairs. It is possible with careful handling to prevent exposure, to transplant thousands and thousands of seedlings without the loss of a single tree. The larger the tree to be transplanted, the necessarily greater loss of root surface; yet, with care, large trees may be moved even in summer without the loss of foliage.

Transplanting Large Trees.

Last July, to make place for a new building, my foreman transplanted a large and valuable evergreen without the loss of a single cone. He first soaked the ground thoroughly about the roots to make the earth cling to them; then he dug a great circle about the tree and undermined it, raising it out of the hole on timbers, and carefully skidded it to a new hole dug to receive it. The crevices were carefully packed in with earth and the hole filled and leveled up to the surface. The ground was kept moist about the tree, and as the root-hairs were never exposed, the tree showed not the slightest inconvenience from this transplanting.

Nursery Treatment.

In taking trees from nurseries and preparing them for shipment, there must necessarily be more or less exposure of the roots, but reliable nurserymen take care that this exposure is the least possible.

If properly handled, the trees are loosened in the ground with a digger or spade, and the roots not removed from the ground till the trees are to be bunched and loaded on wagons. The loads are covered with canvas while going to the packing-sheds or heeling-in grounds. In being boxed they are packed in with damp straw and peat, and if shipped long distances the boxes are lined with waxed paper. Reliable nurserymen, who well understand the delicate nature of tree roots, and who guarantee to fill in gaps the second season, take good care to see that trees are carefully handled and packed. It is usually at the other end of the line that the injurious treatment comes in. Perhaps the farmer is not prepared to plant the trees, and they heat or dry in the boxes while he is digging the holes.

Making a Tree Comfortable.

In planting a tree to make it grow—and there should be no other aim—the tree should be made just as comfortable in its new environment as possible. If the land is wet it should be drained, for trees will never thrive with wet feet. The best results are obtained by preparing the land previous year for the setting of the trees. Clover or cowpeas plowed under in the fall will make humus the following year and keep the soil moist about the roots. Trees will often do well in poor soils and unfavorable conditions if good soil is placed about their roots, so that they get a good start the first year or so. After they become established they can do considerable towards taking care of themselves.

Pruning for Transplanting.

The hole dug for a tree should be large enough so that the roots may be spread out naturally in all directions. Yet it is not necessary to dig very wide holes if the trees are heavy-rooted, for the roots of a tree always need trimming back at transplanting time. Cut back all roots larger than a lead-pencil, leaving a clean-cut surface. Remove all broken or lacerated roots and those that have become dried and dead. The cut surface should always show fresh, living wood. When these surfaces come in contact with moist soil the cambium grows out over the end and forms a callus, from which new roots start very readily.

In trimming the roots it is best to make a sloping cut, with the cut surfaces facing downward. When such a tree is set, the cut surfaces will always come in contact with the soil, and the callus forms readily. It is thought by some that the cut surfaces facing downward cause the tree to become deeper rooted than when cut otherwise. This may have

some effect on making trees deep-rooted, but more, doubtless depends on the nature of the soil.

Brace-Roots.

If the ground is a hard clay in the bottom of the holes it will pay to haul good earth and put a shovelful or two in each hole. As the tree is lined up, it should be placed so that the large or main roots are in line with the prevailing wind. It will be noticed by those handling trees that the largest or main roots usually grow in directly opposite directions from the base of the trunk, and seldom at right angles to each other. These large roots form a sort of root axis, and are sometimes known as the brace-roots of the tree. If care is taken in setting the tree, so that the brace-roots are in line with the prevailing wind, the tree will be firmly fixed and not easily affected by storms. If, on the other hand, the main root axis is placed at right angles to the prevailing wind, the top is rocked backward and forward, as if on a hinge. Attention to this point will save many trees. The neglect of it is often seen where the collar of the tree works a hole three or four inches across. This, of course, causes great loss of moisture and injury to the roots. Trees should usually be tilted a few degrees towards the direction of the prevailing wind.

The Planting-Board.

One of the quickest and most accurate methods of setting trees is by the use of the planting-board. This board is usually about six feet long and four inches wide. It has a hole bored near either end, and on the middle of one side, exactly between these holes, a notch cut about half-way through the width of the board. When the ground is staked out and everything ready for planting, the planting-board is placed so that the notch is close about a stake where a tree is to be set. Iron or wooden pins are thrust through the two holes of the board; then the board is lifted off one pin and thrown around on the other, out of the way. The hole is then dug, and when the board is swung around and dropped over the first pin the notch will indicate exactly where the tree is to be set. By beveling the notch a trifle, the slope to the prevailing winds may be given by fitting the tree every time into the notch. This method is rapid and so accurate that orchards may be put in on straight lines without the trouble of sighting the trees.

Filling in the Holes.

This is the most important step in the whole operation. To get the best results, moist soil must be placed closely about the roots, so that there are no air holes or crevices. The best instrument for accomplishing this work is the human hand. When the tree is placed in position the roots are spread out and a shovelful or two of the finest and best earth thrown upon them. This should be carefully worked into the crevices with the fingers, and when the hole is about a third full, all

the earth should be tamped down solid. The bigger the feet and the heavier the man, the better for the tree. There is little danger of tramping it too much, but trees often die for lack of tramping. After the roots are all covered and packed in tightly, the hole may be filled with the remainder of the earth. The surface should be left loose; tramping it would pack the soil so that it would lose moisture and dry out the trees. A mulch of manure about each tree is a good thing to conserve moisture.

Pruning the Top.

Since the root surface has been reduced in transplanting the tree, it is necessary to cut back the top in similar proportion to maintain a balance between top and root. If this is not done when the tree comes into leaf the foliage will give off moisture faster than the reduced roots can supply it, and so the tree is dried out and killed. With peach-trees all the side branches are usually removed and the leader headed back. In most other trees all side branches are removed but three or four, and half the last year's growth on these cut back. In this way the equilibrium of top and root is restored, and if the ground is cultivated failure should not be expected.

Transplanting Evergreens.

Evergreens are notably difficult to transplant successfully. This is due to the fact that, being evergreen, they are constantly giving off more or less moisture and do not come to as complete a dormant condition as deciduous trees. For this reason, especial care is necessary in transplanting to see that the root-hairs are exposed as little as possible. Simply shaking the earth from the roots of evergreen trees seems to injure them. To get the best results with evergreens they are best taken up when the earth is wet about them, as in early spring; or they may be irrigated to make the mud adhere to them. In setting they should be very carefully tramped, so that there are no holes about the roots. If these precautions are followed, as good results can be obtained in transplanting evergreens as in setting other trees.

Planting Trees From Forests.

Many people complain of having poor results in transplanting trees from woods or natural forests. Let us look at the reason: Young trees grown in the forest, under the protecting shade of their mother trees, have almost ideal conditions of growth. The forest canopy above protects them from wind and from the intense rays of the sun, while all the necessities of moisture and plant food. To remove a tree from such conditions to an open field is to give it a great shock, if it is not very carefully handled and tended. The soil to which such a tree is removed should by artificial means be made to resemble as closely as possible the virgin fertility of the forest soil. As more roots are removed from a forest seedling in transplanting than from a nursery-

grown tree, the top will have to be cut back more. In setting, all the spongy leaf-mould should be removed from the roots, for when exposed this porous matter readily dries out. In place of this mould the earth should be most carefully packed about the roots. With forest seedlings it is always best to mulch the surface of the ground about them.

Puddling Roots.

It is now a common practice to puddle the roots of trees by immersing them in a thin batter made of clay and water. This keeps the air from robbing the roots of moisture and is a good protection to the roots while planting. Trees that become dried should always be puddled, for it tends to restore them to their natural condition. If trees are badly dried in being shipped, it is often a good plan to bury them, top and all, in moist earth for a few days before planting.

Planting Yearling Trees.

A great many planters make a practice of setting large two-year-old nursery trees. Better results can be obtained, however, in the long run by setting one-year-old-trees. Besides costing less and being less expensive to ship, the one-year-old tree is easier to transplant, and a greater proportion of them live. The two-year-old tree has its top formed in the crowded nursery row, and therefore does not develop as well as in the open conditions in the orchard. Many two-year-olds have to be cut back to such an extent to obtain a good top that they are overtaken by the one-year-old tree started under more favorable conditions.

THE BOX PACKAGE; ITS USE AND LIMITATIONS.

By S. W. Fletcher, Director of the Virginia Agricultural
Experiment Station

(Abstract of address before the American Pomological Society,
September 15, 1909.)

The barrel has been the standard and almost the only package for winter apples for over half a century. It has several distinct advantages. Owing to its rounded sides, it can be packed easily and rapidly, even by the unskilled, and, for the same reason, it can be handled more easily by rolling than any other package of equal bulk. Until within ten years it has also been a cheap package. Now barrels cost most fruit growers from 30 cents to 40 cents, instead of 15 to 30 cents as formerly. The apple barrel is an eastern package, and is made of hardwood, usually of elm and oak, which are more common in the east than in the west.

History of the Box Package.

The apple box, on the other hand, is a western package. Open bushel boxes have long been used in the east for shipping vegetables and early apples. The closed box has also been used, somewhat, by a few individuals, notably by L. Woolverton, of Grimsby, Ont., who was exporting wrapped apples in bushel boxes, 128 apples to the box, fifteen years ago. But the real introduction of the apple box as a commercial package for winter apples is coincident with the rise of commercial apple growing in the Pacific coast states within the past fifteen years. The prototype of the apple box is the orange box. The Pacific coast apple growers face conditions that have made the box, rather than the barrel, their almost exclusive apple package. The most important condition is their great distance from markets, and consequent high transportation charges. It costs 50 cents to raise a bushel of Hood river apples, and 50 cents more to lay it down in New York. This makes it imperative to economize space, and the box packs tighter in a car than the barrel, especially the old fashioned barrel with a three or four-inch bulge.

But the most important effect of the great distances and high rates has been on the grading of the fruit. There would be no profit in paying such high transportation charges on inferior fruit. Only fruit that will sell at the top of the market will justify the outlay. This means carefully graded fruit, fully as much as high quality fruit. The box package enforces careful grading. The shiftless "shuffle packing" is

still used in some parts of the west, but in most cases apples packed in boxes are placed tier upon tier. This is expensive, but the cost of grading is small compared with the cost of getting the fruit to market, and the returns usually justify the outlay. The points to be noted are that great distance from markets and high transportation charges have forced the western fruit grower to grade more carefully than his eastern competitor, and that the bushel, in which uniformity is imperative, has thus become the distinctive package.

Another condition that has had some influence is the fact that the soft woods predominate in the west, and the hardwoods in the east. The barrel is a hardwood package; the box is a softwood package. Some boxes are now being made in the east from poplar and yellow pine, but they are decidedly inferior to the fir, spruce and white pine boxes of the west, not only because they are heavier and more rigid, but also because they come in narrower widths. The bushel apple box is the most logical and fitting package that the west could develop out of the material at hand. In view of the rapid reduction of our natural forests, we must expect to soon face the necessity of forest tree culture. The soft woods, being more rapid in growth, will become more and more cheaper than the hardwoods, hence the barrel will tend to become more and more costly, as compared with the box.

High Prices for Western Box Fruit.

Eastern apple growers have been more or less nettled, and their ambition stimulated, by the high prices received for western box fruit in recent years. It is rather galling to eastern men to see a bushel box of Washington or British Columbia apples selling for the same price as his own three-bushel barrel. It relieves him somewhat to dilate upon the superior "quality" and "flavor" of his own fruit, but the buyer goes right on paying the same discriminating prices. The easterner is apt to then lay the blame for his own low prices on the type of packages he uses. The truth, however, is that the high prices received for western box fruit are due chiefly to superior grading, and very little to superior quality or to a more convenient type of package. In other words, the higher price is payment for the superior skill and enterprise of the grower rather than for any special natural endowments of soil and climate that have made it possible to produce unusually good fruit. When a buyer pays \$3 a box for Hood river Spitzenburgs, and \$4 a barrel for New York Spitzenburgs, he is paying, not necessarily for superior quality of fruit, nor for a superior type of package, but for superior grading. The comparison, therefore, is not so much between the box and the barrel as a type of package, as between western grading and eastern grading.

It is as unwise for the eastern apple grower to adopt the package of the western apple grower without careful consideration as it has proved to be unwise for the west to adopt the varieties and cultural methods of the east without change. In the past five years many of

the eastern apple growers have tried the box package. There have been more failures than successes. It is evident that the east is not yet ready for the box as a universal apple package; that under certain conditions the barrel is far preferable. Each grower must decide this matter for himself, having in mind the following points:

Comparison of Box and Barrel.

1. Quantity of Fruit.—It is probably true that the box is a more convenient quantity of fruit for the "ultimate consumer," who has recently received so much attention by tariff makers, than the barrel. Over 30 per cent of our population now live in cities, and the percentage of city dwellers is increasing with each census. A majority of the city and town people, constituting the main market for fruits, have no cool cellar in which fruit can be stored. Their storage facilities are limited to the refrigerator. They wish to buy only such a quantity of fruit as will keep at the ordinary temperature of the house while being used. Under such conditions the box is a more convenient package than the barrel. A large basket of the Climax type, holding about a peck, would be more convenient still, especially for summer and autumn apples. On the other hand, there is a large demand for apples in bigger bulk, not only because of the custom of years, but also for the winter supply of those who have a cool cellar, and for export. Certain varieties carry better across the water in barrels than in boxes, because the latter permit the entrance of salt air.

2. Cost of Packages.—On the Pacific coast apple boxes cost from 6 to 9 cents, knocked down. As three boxes can be packed out of one barrel, at that price the boxes are cheaper than the barrel. In the east we pay from 11 to 21 cents per box. In Virginia boxes cost 10 to 12 cents, in Minneapolis, Minn., 14 cents, while Mr. Robert Brodie of Montreal states that his boxes cost 21 cents. The price of barrels in the east, this fall, ranges from 30 to 45 cents, with an average of about 35 cents. Bought knocked down in carload lots they have cost certain growers 28 to 29 cents. The inferior quality of some eastern made boxes, as noted previously, should also be considered. The comparative cost of barrels and boxes is a local problem, and each grower will have to get estimates.

3. Grading and Packing.—The fundamental difference between the two types of packages is here. The box encourages, and almost enforces, uniform grading, while the barrel permits carelessness in this respect. The cost of packing is also an item. Where a very large quantity of fruit is packed by specially trained men, it costs little if any more for labor to pack in boxes than in barrels. But the small grower, and especially one who has been accustomed to the barrel pack, will find that it costs from one-third to one-half more to pack in boxes than in barrels. It should be noted also that very small, or otherwise inferior fruit, seldom if ever yields as high returns in the box pack as in the barrel pack. Only the large sizes go well in boxes, whether

he can get more by sorting out his fancy and No. 1 stock for boxing, and selling the smaller fruit in barrels, than to sell all in barrels as No 1's. Another point to be considered is the shape of the fruit. It is almost imperative that box fruit should be quite regular in shape. Lopsided and mis-shapen fruit, like the York, especially from young trees, would not pack well in boxes. The most important point under this heading, however, is that no one has ever succeeded with the box pack using common stock. Only fancy and No. 1 fruit of the best quality has paid in boxes. By intensive methods, and especially by thinning the young fruit on the trees, many of the best western growers have been able to produce fruit 95 per cent of which is fancy. Practically all of the Hood river fruit is box fruit. I doubt if, on an average, 30 per cent of the apple crop of Virginia, or Ontario, or any other part of the east, is box or fancy fruit. This point must be kept emphatically in mind when the suggestion is made that the box should become the exclusive apple package of the east, as it is now in the west.

4. Quality of Fruit.—Of far less importance than the grade of the fruit in the package, in respect to the question before us, is its quality. It is a fact, however, that the box fruit that has commanded the highest prices is mostly of varieties of high quality —Winesap, Spitzenburg, Newtown. But other varieties, even some of very indifferent quality, have been sold in the box package to great advantage, showing that the style of package and the grade of fruit, rather than its flavor, are the deciding factors. However, the general experience has been that the better quality of the fruit, the more apt it is to pay in the box pack. If varieties of inferior quality pay in the box pack, it is because the style of package and the grading outweigh the deficiency in quality.

Experience With the Box Package in East.

Having in mind the essential difference between the box and the barrel trade, it does not seem strange that most of the attempts to use the box in the east have not resulted satisfactorily. It is probably near the truth to say that eight out of every ten trials of the apple box in the east have been unsuccessful. A notable example is an experiment by the field pomologist of the United States Department of Agriculture, Mr. W. A. Taylor, several years ago. He sent abroad during two seasons, eight carloads of carefully graded boxed Baldwin, York and Newton, but with indifferent results as compared with barrels. There are many possible reasons for these failures.

1. Custom.—Custom is hard to change, and the box package is an innovation in the east. As a rule, eastern buyers and grocers do not look forward with favor upon the box, partly because the profits in repacking and selling a barrel of indifferently packed apples are apt to be greater than in handling three well packed boxes. If the producer could deal direct with the consumer it would be different. There is no doubt but that a majority of the consumers prefer the box, or a smaller package, if the fruit did not cost much more.

2. The Market.—A good deal depends upon what a certain market prefers in the matter of fruit packages as well as in fruit varieties. West of the Mississippi there is special necessity for caution in this respect. Some buyers want their fruit in boxes, and others prefer barrels, according to the market they expect to reach. The grower who ships should be equally wise.

3. Poor Packing and Grading.—More failures arise from this cause than from any other. The art of packing boxes is not acquired in an hour. It is work for specially trained men, not for the average farm help. In this respect it differs materially from barrel packing, which may be quite well done by ordinary help. Moreover, the habits of several generations of men who have packed in barrels, using "facers" and "fillers" have descended to the fruit growers of today and many of them find it extremely difficult to keep the smaller, poorly colored, or slightly imperfect specimens from gravitating to the bottom of the box. It will take a generation or two, perhaps, to breed out that habit. The western man deserves no credit for being more honest in this respect for, as has been pointed out, honesty was not merely the best policy for him, but the only policy that would pay freight rates.

General Conclusions.

The drift is all towards the smaller package. This is in keeping with the trend of the times with respect to other commodities. There is no doubt but that the box package, or at least the smaller type of package, will some time entirely supplant the barrel. The smaller package will not necessarily be made of wood. We can expect the wooden package to be replaced, eventually, by paper, cellulose, or some other cheaper material. Even now some very substantial paper boxes are on the market. When speaking of the box type of package, therefore, we refer to the size and shape of package, rather than to the material.

But while the box type of package is the ideal toward which we are rapidly working, it by no means follows that every eastern fruit grower should begin packing in boxes at once. He should begin only when he is ready, and nine-tenths of the growers are not ready. To be ready for box packing means that the grower can get good boxes about as cheap as barrels, bushel for bushel; that he is able to grow a crop of fruit, preferably of high quality varieties, at least 90 per cent of which is fancy or No. 1; that he is able to command skillful and experienced packers; that he is able to put a large quantity of box fruit on the market, not one year only, but year after year, so as to win a reputation for the brand, and that he ships his fruit to markets that are already familiar with the box pack and take kindly to it. At the present time not one apple grower out of ten, east of the Mississippi, is able to meet these conditions.

With respect to the market the fruit grower must recognize the different demands of two entirely different types of markets. One of these, the common or general market, will pay a fair price for good or

common stock. The other, the special or fancy, will pay a fancy price for fancy stock. At the present time the box package supplies the special or fancy market almost exclusively, while the barrel package supplies both, but more especially the common or general market. These two classes of market will always exist, or as long as some people are more successful in accumulating money than others. It goes without saying that the demand for cheap or common fruit, at a fair price, will continue to be very much greater than the demand for fancy fruit at a high price, because there are many more people who are in moderate circumstances than there are people who are able to pay fancy prices for fruit. The proportion of fruit growers who are able to grow fancy fruit is as small as the proportion of consumers who are able to pay fancy prices. Location, soil, and the varieties best adapted thereto may make it more profitable to grow staple varieties for the common market. This cheap fruit—the main supply of the great middle class of people—will be marketed in barrels to best advantage for many years to come.

The successful marketing of apples in boxes depends so much upon skillful grading and packing and upon the possession of a large quantity of fruit so packed, that it seems likely that very little impetus will be given to box packing in the east except through co-operative shipping associations. Here and there an exceptional grower may find it profitable to pack fancy grades of certain varieties in boxes, but it does not seem probable that box packing will make much headway in the east except through the co-operative shipping associations, with their trained business manager and their trained crews of trained packers.

These conclusions indicate that the eastern fruit grower should be a conservative on the subject of the box apple package. The drift is towards the smaller package, but at the present time, and for many years to come, apple growers who are so situated that they must produce apples for the general or common markets—which means a majority of the growers—will find the barrel more profitable. With the advent of co-operative shipping associations the box package will become more and more common in the east, and eventually even for the common grades of fruit.—[National Horticulturist, November, 1909.]

PROCEEDINGS.

Proceedings of the Annual Meeting of the Nebraska State Horticultural Society, held in Agricultural Hall, at the State Farm, Lincoln, January 19, 20, and 21, 1909.

ANNUAL MEETING.

PROCEEDINGS.

The fortieth annual meeting of the Nebraska State Horticultural Society convened in Agricultural Hall, at the State Farm, Lincoln, Tuesday, January 19, 1909, at 9:00 A. M. The following program was carried out:

Tuesday, January 19.

9:00 A. M.

Arranging fruits and flowers. Renewing acquaintances and membership.

2:00 P. M.

Invocation.....Rev. I. F. Roach, Lincoln
Address of Welcome.....Prof. R. A. Emerson, Lincoln
The Relation of the Horticultural Society to the state.....
.....C. H. Barnard, Lincoln
Cedar Apple Rust.....Prof. E. M. Wilcox, University of Nebraska
Secretary's Report
Treasurer's Report
Question Box, conducted by C. H. Green

Wednesday, January 20.

9:00 A. M.

Outlook for Commercial Orcharding in Western Nebraska.....
.....E. F. Stephens, Crete
Commercial Apple Growing in Nebraska.....Prof. R. A. Emerson, University of Nebraska
Question Box

11:00 A. M.

Election of Officers
Business Session

2:00 P. M.

Care and Cultivation of Cannas.....J. R. Simanton, Falls City

Best Twelve Ornamental Shrubs for Home Adornment.....
J. H. Hadkinson, Benson
 Reports of Delegates to other societies
 Question Box

Thursday, January 21.

9:00 A. M.

Forest Trees adapted to Horticultural District No. 12.....
D. C. Bliss, Minden
 Forestry Work being done by the Government, at Halsey, Nebraska....
Wm. H. Mast, Supervisor, Halsey
 Reports from the Directors of the Fruit Districts of the State.

The President, Mr. C. L. Saunders, called the meeting to order at
 2:00 P. M.

INVOCATION.

Rev. I. F. Roach

We thank Thee, Oh Lord, for the many favors that we have received at Thy hand. We are grateful for the bounteous harvest with which Thou hast surrounded us and we thank Thee for those things that lead to the highest citizenship of this state. We thank Thee for our educational interests, for these organizations and associations that are working along the lines of development. We thank Thee that Thou hast shown us that by our labors these fruits and beautiful flowers may be ours, and may we be grateful for all of these beautiful things around about us. We are grateful for the work and interest of the members of this society; help us to more thoroughly realize that the work they are doing leads to a better and higher type of citizenship. We pray that Thy blessing may rest upon this society and may their work continue to be more successful; may they go on and bring forth the many good things yet to be accomplished. May Thy blessing rest also upon the officers of this association, and may their meetings here be pleasant and profitable. Bless the members of this society and the members of all the societies that are in session here. All this we ask in Thy Son's name. Amen.

ADDRESS OF WELCOME.

Prof. R. A. Emerson

Mr. Chairman, Members of the Horticultural Society, Ladies and Gentleman:—Certainly it is a pleasure to me to welcome the Nebraska State Horticultural Society to the State Farm, to these buildings and

grounds, and to this room in particular. It will not take a very long time for me to extend a welcome to you. We assume that you know you are welcome to these grounds and buildings, because we are all citizens of the state of Nebraska, and these buildings belong to you as much as to any of us.

There are particular reasons, however, why I am very glad to welcome you to the State Farm at this time. I feel that the work in horticulture in this state has made much advancements since the last time you met in annual meeting here in this room. The Horticultural Society has done some very good work during the past year, and in fact has all along been doing a very good work, but it is not my purpose to hand a bouquet to the society. There are reasons enough around here why I need not do that. One of the reasons is that I cannot do it well enough, and another reason is that you all know as well and better than I do what you have been doing. One of the reasons why I am particularly glad to welcome you members of the Horticultural Society to the State Farm at this time is that I want you to know more about the work we are doing here at the farm. We have made some definite advancement along the lines of horticulture in the past few years, and in this work our new men here at the State Farm have had a large part of it. We have a new man here in the landscape garden department; some of you have met him and some of you have not. Some years ago there was only one person here who was in full charge of the work in horticulture. Now there are five men and they are giving their entire time to this work. Most of you know Mr. Westgate, who is a member of this society. He has been added to the force here at the farm, he is very much interested in the work of the horticultural department and will be glad to show any of you around whenever you have time to go with him. We have a new man, Mr. Dunman, here in the landscape gardening department. I want all of you men here to meet him and get acquainted with him. He is giving his entire time to the beautifying of this campus and the whole grounds and the campus down at the University in the city. We have several new men here and you should get acquainted with all of them.

I want to tell you also that in coming here for your annual meeting that you are coming to an institution where horticultural instruction is being given this year to more than five hundred students. About half of that number are receiving instruction in the long course in the School of Agriculture. Some are not receiving actual horticultural instruction this year because the courses are not given this year. In the Summer School, where we have a number of the shorter courses, many more are registered. Then too, as many of you already know, we have been carrying on work in the orchards of this state; that is, spraying work. This work has been done in a number of counties, and includes some fourteen orchard in all. We feel that this work has been of much good to show what can be done and also in keeping the orchards in good shape. And this work where it has been done for a number of years is of much benefit to the particular orchards in succeeding years. The benefit has

been to the particular communities, of course, but we want to continue this work in spraying so that the horticultural interests and the orchard interests of the state will be brought closer together and also be brought up to a higher standard. There are many things too besides spraying that should be done in connection with the horticultural work in Nebraska, and in this connection the men representing the Department of Horticulture here at the State Farm are devoting their entire time throughout the winter months and school season to spreading the doctrine of horticulture. Our orchards and homes can be made much more profitable and beautiful and the surroundings of the farm home can also be made more beautiful.

The increased beauty of the campus around here is probably one of the first things that you will notice as you come in. Our plans are to make this campus the most beautiful spot in the state of Nebraska. The state certainly can afford to make this campus beautiful. Any educational institution should have the best possible surroundings, but there is a reason why this particular educational institution should have such surroundings. That is because of the large number of young men and women from over the whole state who come here to school, it will give them something to take home with them. We know that many things can be grown successfully in all parts of the state, and in some parts of the state many more things can be grown than people imagine. Our climate for the whole state may not be as favorable as that of some other states, but it is not bad. It is along this line of work that we are engaged here at the state farm, and we want the help of the Horticultural Society. So I am especially glad to welcome the society to the state farm at this time, for we are all working along the same line.

The President: Professor Emerson's welcome to us is surely most welcome. I believe I voice the sentiment of all the members of this society when I say that we are always glad to come to the State Farm for our meeting. I believe the work we are doing and the information we are giving out is being appreciated in the state. I feel that we are doing a good work, and that the Horticultural Society is showing itself worthy of the confidence placed in it by the people of the state. We are glad to be here again for our annual meeting and we hope that it will be of much benefit to all of us.

Professor Bruner: Mr. President, Ladies and Gentleman. I do not have a place on your program at this time, but I am very glad to be here and to have the opportunity to say a few words at this particular time. As you know, my subject is that of insects and bugs, and I am always interested in them. Of course that is what I am paid for. I am the official bug-catcher.

A few days ago I received word that something like seventy-five nests of brown-tailed moths had been found on shipments of apple, pear and

cherry seedlings. Now perhaps you do not realize that this may be a rather dangerous thing for apple growing, and in fact for the growing of fruit trees of all kinds. And possibly you may not know that the brown-tailed moth is present in this country. The state of Massachusetts has been appropriating all the way from fifteen to twenty thousand dollars for fighting this pest and the gypsy moth also. Likewise with the states of Connecticut, Rhode Island, and the other states in which these insects are being found, and unless the proper methods are pursued, this pest is liable to become distributed over the entire country. The brown-tailed moth multiplies very rapidly, it safe to say that the off-spring of a single brown-tailed moth is in the neighborhoods of one thousand caterpillars. They hatch just before winter sets in and live within that web during the winter. These webs hang to the trees. Certainly we do not want either the brown-tailed moth nor the gypsy moth here. The gypsy moth is an insect found throughout Japan and in Africa and Europe. The brown-tailed moth is even more widely spread, for it is often driven for long distances. It is in the New England states, and it is to our interest out in this part of the country to see that it is confined to one part of the United States as much as possible.

(Some stereoptican views, illustrating the methods of reproduction, etc., of these insects were shown here).

The President: We will now have the Secreary's report.

REPORT OF SECRETARY.

In connection with my duties as secretary during the past year, the best indication that horticultural work and interest in Nebraska is growing is the continued increasing demand for our annual reports and bulletins. This growing demand for horticultural information is due no doubt in a large degree to the efforts and results accomplished in the work of the Farmers' Institutes. It is through these Insitutes and lectures that the right class of people are reached and interested in our work. As has been suggested several times in our meetings, this interest in horticulture should be maintained and pushed still further to include the younger men, those who expect to come to the State Farm to school. They should be shown the direct value and practical side of horticulture along with their other agricultural studies and work.

Since our last meeting I have sent out 8675 of our annual reports. This number includes many of our old back reports, which for several years have been stored in the room of the State Historiacle Society at the University. And of all these reports sent out nearly all of them have sent direct to the Farmers' Institutes. And now that the number of Institutes is increasing so rapidly, we will not be able to furnish as many reports as heretofore. It will be necessary to either cut down on the

number of Institutes to which reports are sent or send fewer reports to all the meetings. I believe the latter plan be better, to send fewer reports, but send them to practically all of the Institutes. Aside from this large number of annual reports sent out, something over 2,000 of our bi-monthly bulletins have been mailed. The demand for these bulletins is constantly increasing. Occasionally it is necessary to print an extra number of some of the bulletins, which may be of more than ordinary interest, such as the report of the State Entomologist.

As has been brought out many times during the past few years, one of the most important problems which our society has to deal with is that of membership. We do not have a large enough membership roll. Although we are in a fairly good condition financially, still we do not do the good we could if we had members. I would be in favor of adopting a new method of securing members, probably some plan patterned after the Minnesota way of getting new members. There they have horticultural lecturers in connection with their Farmers' Institutes, who solicit membership at the time of the lectures and demonstrations. During one of their seasons recently, by this method, they secured 361 new members for their Horticultural Society.

In connection with this report I have one recommendation, which I would like to suggest. I will make it as a suggestion simply to get it before the society for discussion. That is in regard to a State Inspection Law for injurious insects and insect diseases. While we may not just now regard Nebraska as important enough in commercial horticulture to warrant such a step, still something should be done along this line very soon. Nearly all of our neighboring states have some constitutional requirements on this subject of trees and fruit being from injurious insects and insect diseases. Professor Bruner informs me that the Brown-tailed Moth is being reported as distributed through the eastern part of the United States, and that it has come probably from shipments of stock from France. In this or other cases, good inspection laws, fully enforced, would guard against much damage that might result.

Two members of our Society have died during the past year, Theodore Williams, of Benson, and W. G. Swan, of University Place.

The following is a list of the warrants issued and paid during the past year:

No.	Warrants Issued	Amount
1	Chas. Graw, premium.....	\$ 4 00
2	Don Gridley, premium.....	2 00
3	E. Hornung, premium.....	5 00
4	David Hunter, premium.....	13 00
5	R. W. Hesseltine, premium.....	9 00
6	Marshall Bros, premium.....	3 00
7	B. L. Shellhorn, premium.....	21 00
8	E. F. Stephens, premium.....	11 00

No.	Warrants Issued	Amount
9	Chas. L. Saunders, Per Diem.....	9 00
10	C. H. Green, Per Diem	9 00
11	Void, Receipted by Youngers	
12	J. A. Yager, Per Diem	9 00
13	W. G. Swan, Per Diem.....	9 00
14	A. J. Brown, Per Diem.....	9 00
15	Don L. Russell ,part pay reporting annual meeting.....	25 00
16	Nebraska Paper and Bag Co., supplies.....	8 70
17	Chapin Bros, rent on vases.....	2 00
18	L. M. Russell, salary, January	83 00
19	Not drawn	
20	Don L. Russell, balance for reptoring annual meeting.....	25 00
21	Nebraska Paper and Bag Co., supplies.....	2 48
22	Dale Russell, moving reports from Historical rooms.....	6 50
23	L. M. Russell, postage.....	10 00
24	Globe Delivery,freight and draygae on books.....	44 04
25	Rudge & Guenzel, bookcase.....	19 50
26	Benton Bros., bulletins, notices.....	32 00
27	L. M. Russell, salary for February.....	84 00
28	Jacob North & Co., supplies.....	7 00
29	Globe Delivery Co., freight and drayage on books.....	48 13
30	L. M. Russell, salary for March.....	83 00
31	Benton Bros., 500 bulletins.....	14 00
32	L. M. Russell, salary for April.....	83 00
33	Benton Bros., 500 bulletins.....	28 00
34	L. M. Russell, salary for May.....	84 00
35	J. D. Reams, per diem.....	6 00
36	A. J. Brown, per diem.....	6 00
37	C. H. Green, per diem.....	6 00
38	W. G. Swan, per diem.....	3 00
39	L. M. Russell, salary for June.....	83 00
40	C. H. Green, per diem.....	12 00
41	Chas. L. Saunders, per diem.....	9 00
42	W. G. Swan, per diem.....	9 00
43	Don. L. Russell, reporting summer meeting.....	50 00
44	Benton Bros., 500 bulletins.....	21 00
45	L. M. Russell, salary for July.....	83 00
46	Jacob North & Co., supple.....	5 00
47	G. W. Alexander, premiums.....	20 00
48	Fred Behlen, premiums.....	3 00
49	Jay I. Barnard, premiums.....	141 00
50	G. S. Christy, fruit for State Farm.....	11 50
51	G. W. Alexander, balance on remiums.....	1 00
52	R. T. Chambers, premiums.....	18 00
53	Aye Bros., premiums.....	22 00
54	R. F. Adkins Jr., premiums.....	1 00

No.	Warrants Issued	Amount
55	J. W. Alder, premium.....	2 00
56	Jay I. Barnard, balance on premiums.....	4 00
57	Wm. Borgman, premiums.....	3 00
58	C. Boush, premiums.....	4 00
59	Crete Nurseries, premiums.....	220 00
60	C. B. Camp, premiums.....	61 00
61	G. S. Christy, premiums.....	75 00
62	Dole Floral Co., premiums.....	109 00
63	H. Davey, premiums.....	2 00
64	Arnold Egger, premiums.....	1 00
65	E. E. Smith, premiums.....	6 00
66	Forest Hill Fruit Farm, premiums.....	11 00
67	C. H. Green, premiums.....	178 00
68	A. B. Gadd, premiums.....	1 00
69	Chas. Grau, premiums.....	2 50
70	J. Hildebrand, premiums.....	4 00
71	G. W. Hummell, premiums.....	1 00
72	Fred Hoover, premiums.....	8 00
73	E. Hornung, premiums.....	2 00
74	N. W. Heitman, premiums.....	3 00
75	G. W. Hagan, premiums.....	3 00
77	Wm. Hayes, premiums.....	4 00
78	C. W. Isaac, premiums.....	7 00
79	Geo. Ihrig, premiums.....	6 50
80	J. H. Legget, premiums.....	1 00
81	F. E. Lockwood, premiums.....	1 00
82	R. Lehy, premiums.....	1 00
83	Arnold Martin, premiums.....	2 00
84	Geo. Mayer, premiums.....	1 00
85	Geo. Pasco, premiums.....	9 00
87	L. M. Russell, premiums.....	9 00
87	L. M. Russell, premiums.....	30 00
88	H. J. Rosenbaum, premiums.....	6 00
89	Geo. Schamm, premiums.....	2 00
90	W. B. Surshen, premium.....	1 00
91	W. G. Swan, premiums.....	6 00
92	R. A. Smith, premiums.....	4 00
93	Ed Williams, premiums.....	128 00
94	J. W. Wharton, premiums.....	2 00
95	H. C. Young, premiums.....	2 00
96	Geo. Marshall, superintendent hall.....	24 00
97	A. J. Brown, Per diem.....	24 00
98	J. A. Yager, Per diem.....	24 00
99	Chas. L. Saunders, Per diem.....	9 00
100	W. G. Swan, Per diem.....	24 00
101	C. H. Barnard, Per diem.....	24 00

No.	Warrants Issued	Amount
102	Peter Youngers, returned.....	
103	C. H. Green, Peer diem.....	24 00
104	Lloyd Phillips, 11 days work at fair.....	16 50
105	Myron Richards, 5½ days work at fair.....	11 00
106	Chas. Harvey, 6 days work at fair.....	12 00
107	Mrs. J. W. Bedell, 5 days work at fair.....	7 50
108	L. M. Russell, salary for August.....	84 00
109	L. M. Russell, Peaches for fair.....	12 60
111	Jacob North & Co., Entry books and cards.....	10 50
110	L. C. Chapin, Judging floral exhibit.....	5 00
112	Hammond Printing Co., book of diplomas.....	7 50
115	Nebraska Paper & Bag Co., supplies.....	2 59
116	Rudge & Gunzel Co., supplies.....	18 09
117½	Chapin Bros., Smilax vases.....	20 00
117	W. J. Blystone, labor and supplies.....	59 20
118	Lincoln Ice & Cold Storage Co.,	11 19
119	Jacob North & Co., supplies.....	3 95
120	J. W. Scarborough, decorating and material.....	27 45
121	Dale Russell, assistant secretary.....	15 00
122	L. M. Russell, salary for September.....	84 00
123	Globe Delivery, drayage.....	3 25
124	C. H. Frey, flowers for W. G. Swan, Friend.....	10 00
125	R. M. Tidball, lumber for Horticulture hall.....	6 82
126	Benton Bros., Bulletin No. 19.....	48 00
127	G. W. Shaver, grapes for State fair.....	15 00
128	L. M. Ruseell, salary for October.....	83 00
129	Chas. L. Saunders, per diem.....	6 00
130	J. A. Yager, per diem.....	6 00
131	Peter Youngers, per diem.....	6 00
132	C. H. Green, per diem.....	6 00
133	A. J. Brown, per diem.....	6 00
134	L. M. Russell, salary for November.....	83 00
135	Benton Bros., bulletins and supplies.....	38 25
136	Nebraska Paper & Bag Co., supplies.....	8 83
137	L. M. Russell, postage.....	10 00
138	C. S. Harrison, delegate to Minnesota meeting.....	10 00
139	L. M. Russell, incidentals for office.....	32 04
140	L. M. Russell, postage.....	10 00
141	L. M. Russell, salary for December.....	84 00
142	L. M. Russell, balance incidentals for office.....	43 75
143	Benton Bros., printing programs.....	12 00
144	Nebraska Paper and Bag Co., supplies.....	1 56
\$834.00	Geneva, Nebraska, September 9, 1908.	

Received of L. M. Russell, eight hundred thirty-four dollars (834.00.)
 \$800.00 from State Agricultural Society, \$24.00 for fruit sold.

PETER YOUNGERS, Treasurer.

**Cash Received During the Year the Amount Having Been Turned Over to
the Treasurer.**

Membership.

January 1908—

6.	E. H. Backus	\$ 5 00
21.	V. V. Westgate	1 00
21.	J. M. Packwood	1 00
21.	S. R. Hall	1 00
21.	F. E. Denny	1 00
21.	J. F. Cars	1 00
21.	A. S. Barker	1 00
22.	A. A. Lash	1 00
22.	J. D. Ream	5 00
22.	Chas Dickinson	1 00
23.	P. G. Vogel	1 00
23.	P. Edinborough	1 00
23.	D. C. Bliss	5 00

February 1908—

13.	J. R. Haggard	75
15.	W. S. Bellows	1 00
15.	E. F. Richards	1 00
20.	J. B. Frey	5 00
20.	J. W. McLearen	1 00
20.	W. R. Ratcliff	1 00
24.	O. P. Faol	1 00

September 1908—

1.	B. W. Cooney	1 00
4.	H. Prichard	1 00
6.	W. E. Balam	1 00

Total	\$ 43 75
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8.	From State Board of Agriculture	\$ 800 00
8.	Fruit sold at State Fair	34 00

Geneva, Nebraska, January 1, 1909.

L. M. Russell, Esq., Lincoln, Nebraska.

Friend Russell:—I received your favor containing Warrant 142 for \$43.75, which I will apply to membership fee, received from you.

Respectfully yours,

PETER YOUNGERS.

REPORT OF THE TREASURER

Warrants Paid.

Series 1907

No.	Amount
79 R. Leahy	\$ 50

Series 1908

No.	Amount
1 Chas Grau	\$ 4 00
2 Don Gridley	5 00
3 E. Hornung	5 00
4 David Hunter	13 00
5 R. W. Hesseltine	9 00
6 Marshall Bros.	3 00
7 B. L. Shellhorn	21 00
8 E. F. Stephens	11 00
9 Chas. L. Saunders	9 00
10 C. H. Green	9 00
12 J. A. Yager	12 00
13 W. G. Swan	9 00
14 A. J. Brown	9 00
15 Don L. Russell	25 00
16 Nebraska Paper and Bag Co.	8 70
17 Chapin Bros.	2 00
18 L. M. Russell	8 00
20 Don L. Russell	25 00
21 Nebraska Paper and Bag Co.....	2 43
22 Dale Russell	6 50
23 L. M. Russell	10 00
24 Globe Delivery Co.....	44 04
25 Rudge & Guenzel Co.....	19 50
26 Benton Bros.	32 00
27 L. M. Russell	84 00
28 Jacob North & co.....	7 00
29 Globe Delivery Co.	48 13
30 L. M. Russell	83 00
31 Benton Bros.	14 00
32 L. M. Russell	83 00
33 Benton Bros.	28 00
34 L. M. Russell	84 00
35 J. D. Ream	6 00
36 A. J. Brown	6 00
37 C. H. Green	6 00
38 W. G. Swan	3 00
39 L. M. Russell	83 00
40 C. H. Green	12 00
41 Chas. L. Saunders.....	9 00

No.	Amount
42 W. G. Swan	9 00
43 Don L. Russell	50 00
44 Benton Bros.	21 00
45 L. M. Russell.....	83 00
46 Jacob North & Co.	5 00
47 G. W. Alexander	20 00
49 J. A. Barnard	141 00
50 G. S. Christy	11 50
51 G. W. Alexander	1 00
52 R. T. Chambers	18 00
53 Aye Bros.	22 00
54 R. F. Atkins Jr.,.....	1 00
55 J. W. Alder	2 00
56 J. I. Barnard	4 00
57 Wm. Borgman	3 00
58 C. Brush	4 00
59 Crete Nurseries	220 00
60 C. B. Camp	61 00
61 G. S. Christy	75 00
62 Dole Floral Co.....	109 00
63 H. Davey	2 00
64 Arnold Egger	1 00
65 E. E. Smith	6 00
66 Forest Hill Fruit Farm.....	11 00
67 C. H. Green	178 00
68 A. B. Gadd	1 00
69 Chas Grau	2 50
70 J. Hilderbrand	4 00
71 G. W. Hummell	1 00
72 Fred Hoover	8 00
73 E. Hornung	2 00
74 W. W. Heitman	3 00
75 G. W. Hogan	3 00
76 David Hunter	1 50
77 Wm. Hayes	4 00
78 C. W. Isaac	7 00
79 George Ihrig	6 50
80 J. H. Leggett	1 00
81 F. E. Lockwood	1 00
82 R. Leahy	1 00
83 Arnold Martin	2 00
84 George Mayer	1 00
84 George Mayer	1 00
85 J. H. Morrison	2 00
86 Geo. Dasco	9 00
87 L. M. Russell	30 00

No.	Amount
88 H. J. Rosenbaum.....	6 00
89 Geo. Schram	2 00
90 W. B. Swisher	1 00
91 W. G. Swan	6 00
92 R. A. Smith.....	4 00
93 Ed Williams	128 00
94 J. W. Wharton	2 00
95 H. C. Young	2 00
96 Geo. Marshall	24 00
97 A. J. Brown	24 00
98 J. C. Yager	24 00
99 Chas. L. Saunders	9 00
110 W. G. Swan	24 00
101 C. H. Barnard	24 00
103 C. H. Green	24 00
104 Llody Phillips	16 50
105 Myron Richards	11 00
106 Chas Heney	12 00
107 J. W. Bedell	7 50
108 L. M. Russell	84 00
109 L. M. Russell	12 00
110 L. C. Chapin	5 00
111 Jacob North & Co.	10 50
112 Hammond Printing Co.	7 50
113 Lincoln Paper Co.	6 60
114 Benton Bros.	3 00
115 Nebraska Paper and Bag Co.	2 59
116 Rudge & Guenzel Co.	18 09
117 W. J. Blystone	59 20
117½ Chapin Bros.	20 00
118 Lincoln Ice and Cold Storage Co.....	11 90
119 Jacob North & Co.	3 95
120 J. W. Scarborough	27 45
121 Dale Russell	15 00
122 L. M. Russell	84 00
123 Globe Delivery Co.	3 25
124 C. H. Frey	10 00
125 R. M. Tidball	6 82
126 Benton Bros.	48 00
127 G. W. Shaver	15 00
128 L. M. Russell	83 00
129 Chas. L. Saunders	6 00
130 J. A. Yager	6 00
131 Peters Youngers	6 00
132 C. H. Green	6 00
133 A. J. Brown	6 00

No.		Amount
134	L. M. Russell	83 00
135	Benton Bros.	38 25
136	Nebraska Paper and Bag Co.	8 83
137	L. M. Russell	10 00
138	C. S. Harrison	10 00
139	L. M. Russell	32 04
140	L. M. Russell	35 00
141	L. M. Russell	84 00
142	L. M. Russell	43 75
143	Benton Bros.	12 00
144	Nebraska Paper and Bag Co.	1 56
		<hr/>
		\$3,351 73

Lincoln, Nebraska, October 1, 1908.

This is to certify that I have this day received from Peter Youngers, Treasurer of the Nebraska State Horticultural Society, the following list of warrants in exchange for state warrant No..... in the sum of \$1,000.00.

No.	Name	Amount
49	Jay I. Barnard	\$ 141 00
52	R. T. Chambers	18 00
53	Aye Bros.,	22 00
59	Crete Nurseries	220 00
60	C. B. Camp	61 00
61	G. S. Christy	75 00
62	Dole Floral Co.	109 00
67	C. H. Green	178 00
72	Fred Hoover	8 00
86	Geo. Pasco	9 00
87	L. M. Russell	30 00
90	W. B. Swisher	1 00
93	Ed Williams	128 00
		<hr/>
		\$1,000.00

Witness my hand and seal this 1st day of October, 1908.

E. M. SEARLe JR., Auditor

By H. L. COOK, Deputy Auditor.

The Nebraska State Horticultural Society,

In account with Peter Youngers, Treasurer.

1908.

Jan. 15.	Balance on hand	\$2,371 30
June 20.	L. M. Russell, State appropriation	1,500 00
Sept. 9.	L. M. Russell, State Board of Agriculture.....	800 00
Sept. 9.	Cash, L. M. Russell	24 00
Oct. 1.	L. M. Russell, State appropriation	1,000 00

1909.

Jan. 6.	Cash, L. M. Russell	43 75
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\$5,749 05

Total warrants paid	3,351 73
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Balance on hand January 19, 1909.....\$2,397 32

The President: If there are no objections the reports of the Secretary and Treasurer will be referred to the Auditing Committee.

The report of the special committee appointed for the revision of our premium list and recommended list of fruits and ornamentals for the state will now be given.

Mr. Marshall: Mr. Chairman, you appointed as members of that committee Mr. Brown, Mr. Williams, Mr. Green and myself. We have revised the premium list, and we now have this report ready for submission, and I would like to read it. We have made one or two changes in the special rules, and also in the scale of points for judging the different varieties of apples. These changes in the scale of points in the apples does not make ten dollars difference in the amount of premiums in this class. (Here Mr. Marshall read the report of the Committee on Redistricting the state and revision of premium list and recommended fruits, ornamentals, etc., published in this report.)

I move that this report be accepted. Motion carried.

REPORT OF THE AUDITING COMMITTEE.

Lincoln, Nebraska, January 20, 1909.

Mr. President:

We, your committee, have examined the books of the Secretary and Treasurer, and find them correct.

Two warrants to the amount of five (\$5.00) dollars have not yet been paid, so the Treasurer's report shows \$5.00 more on hand than the Secretary's report warrants.

G. S. CHRISTY,
LEWIS HENDERSON.

The following letter was read by the secretary:

Harlan, Iowa, December 21, 1908.

This is to certify that J. M. Bechtel, of Hamburg, Iowa, is the duly appointed and accredited delegate of the Iowa State Horticultural Society to the annual Meeting of the Nebraska State Horticultural Society at Lincoln, Nebraska, January, 1909.

W. M. BOMBERGER,
President of Iowa State Horticultural Society,

By unanimous vote of the society, Mr. Bechtel was made an Annual Honorary member of the Nebraska State Horticultural Society.

Mr. Bechtel: Mr. Chairman and members of the Nebraska Horticultural Society: I am not going to make a speech, but I want to thank you for this honor, which you have just extended to me. I had the pleasure of attending your last meeting, and I must say that I derived a great deal of benefit from it. I came over here just to get some items of interest and information, and I am being satisfied. I have nothing further to say just at present, but I hope to have the privilege of just sitting here and taking in the talks and discussions. All of us have many interests in common, and I want to get all the information I can while I am here. Over in our section of the country we are getting up considerable interest in horticulture by the organizaions of local associations. I live only four miles from the Nebraska line and a short distance from the Missouri state line, and we have a good local association there. We had a very successful meeting this fall and a good fruit show too, and we are looking for a continual increase of interest along horticultural lines. But all I want to do now is to listen to the papers and discussions that are going on here. Thank you.

The President: I know I can say for our society that we are very gald to have Mr. Bechtel here with us, and we hope that he will feel at home here in our meetings and take part in the discussions, too.

Mr. Williams: I want to call the attention of the society to a new organization here at the State Farm, known as the "Nebraska Budders." This society was started here about two years ago, and the plan was to include the young men here who were especially interested in horticulture. The object of this organization is a very worthy one and it is something that our society should encourage in every way possible. I believe most of the young men are here today, and if the President of the society is here we would be ylad to hear from him.

President of the "Nebraska Budders:" Mr. Chairman, our society was started here at first with only about a half dozen of the fellows interested in the subject of horticulture generally. We have grown since then and now have about forty members, and of this forty, about twenty-five are active members. The plan of our society is that each man indicate what particular branch of horticulture he is interested in, and some have interested themselves in strawberry raising, some in grape culture,

etc. We plan to have three papers read at each meeting, and in addition to our regular papers we also occasionally have a competent speaker on some horticultural subject. As there is no other organization in the school here along any particular line, we rather congratulate ourselves on being the first to start anything of this kind. Thank you.

The President: I am sure we are mighty glad to hear of this new association here at the State Farm and to know what they are doing. It is a very worthy purpose they have in view and I know our society will be only too glad to co-operate with them and help them in any way we can.

By motion made and unanimously carried it was voted to make each member of the "Nebraska Budders" association an Annual Honorary member of the Nebraska State Horticultural Society.

QUESTION BOX.

No. I. Why have we lost nearly all of our plum and cherry trees?

Mr. Marshall: I do not know what killed them, but they were probably troubled with different diseases. There are several causes. One of the principal reasons probably is because some persons, when planting an orchard are always trying to get something for nothing. I think that is the cause of most of the trouble with the tree business. When a person expects to get something for nothing he is usually disappointed. I have noticed that the European plum trees have died where the American plums have lived. The European plums seem to be more troubled with what is known as shot-hole fungus, and this is caused principally by neglect and wet weather. If we had a series of good dry years we would not have any of this trouble. We have got to use judgment in this, and have got to study the question out. In the case of cherry trees some varieties kill worse than others. Two or three wet seasons will kill the Early Richmond, and five or six seasons of this kind of weather will kill almost any of the other varieties.

Mr. Brown: This disease of the cherry trees is one of the things that Prof. Bruner is trying to work out at the present time. To my mind it is no more shot-hole fungus than anything else. As Mr. Marshall says this disease is due to wet weather and also to a poor condition and also due to neglect of orchards. We have sprayed for this disease, but during the three seasons we lost about nine thousand nursery trees.

A Member: Mr. Chairman, I asked that question because I would like to know what is the cause of this disease. I noticed that the leaves began dropping off the trees about the middle of the summer. I sprayed my trees.

Mr. Marshall: Spraying would not do any good if the leaves had all fallen off. We did considerable spraying but without any success. We lost a large number of trees away back in 1883 and 1884. It was called

shot-hole fungus, and resulted in a large number of little holes in the leaves. I think the best thing to do is to plant varieties that will best resist this trouble. I believe the time is coming when we will be able to cope with these diseases and have a good deal less trouble and not so much loss. Another thing that we must pay particular attention to is the subject of cultivation. We do not want any weeds in the orchard. We should cultivate as much as possible and in that way do away with all the evaporation that we can. Thorough cultivation is one of the best preventatives, because it stops the evaporation.

No. 2. Which is the best single variety of each of the following Paeonies: White, early; White, late; Red, early; Red, late—not of the fancy kinds, but of the more common ones?

Mr. Harrison: The best early White is Festiva Maxima. The best late White is Mons duPont. There are several others that are good, but these are the two best White ones. The earliest Red one that is good is Agida, and the best late Red variety is La Sublime. One of the highest priced varieties of all and also one of the best varieties is Rosenfield. This is probably the best in a list of seven hundred different varieties. The best late Red variety is Ville deNance.

Question: Would you consider the Festina Mainna better than the Victoria?

Mr. Harrison: Yes, it is certainly better with me than the Victoria.

No. 3. What shall I do for borers in a fifteen acre peach orchard?

Mr. Russell: It depends upon the age of the orchard to a large extent. It is in the case of a younger orchard that the most trouble is experienced with borers. We have had this to contend with to a certain extent in our orchards and we have found that the best practical way to get at this is to simply go after each tree. The borers are usually found about two to four inches under the surface of the ground, and about the only way to do is to go after each tree and dig them out.

No. 4. What shall we do to protect our fruit growers from the dishonest commission men?

Mr. Christy: The plan I adopted was to be my own commission man. I never sent a bushel of apples or peaches or fruit of any kind to the commission men, and I know if the rest of the people would adopt this same plan we would not have any trouble about having the prices of fruit reduced. My plan is to have the fruit well graded, put up in the best kinds of packages that look attractive, and in this way you will not have any trouble in finding a good market for your fruit. That is the best way that I know of to eliminate the commission man.

No. 5. What are the best methods of renovating our orchards?

Mr. Stephens: Some years ago a number of our older orchards were run down a good deal, and a neglected orchard is certainly bad. I think the best way to take care of an orchard is to do spraying at the right time,

prune and fertilize, and in this way you can keep your orchard in fine shape.

No. 6. (a) Is the Shuckle strawberry a staminate variety?

Mr. Christy: Yes, it is a staminate variety, but it is of no practical value.

(b) Does the cherry on a Mazzard stock produce more fiber roots than on the Mahaleb?

Mr. Brown: Yes sir.

The President: I notice Mr. Lyford, who is one of the Regents of the University, is here this morning and we would be glad to have a few words from him.

Mr. Lyford: Mr. Chairman and gentlemen of the Horticultural Society, I do not know that I have any particular speech to make this morning, but as a Regent of the University I am deeply interested in every line of work that makes for human happiness and welfare, and I am especially interested in any line of work that pertains to the dissemination of knowledge. I believe that the work this Society is doing is of great benefit to the people of this country and I do not believe that the work you men have been doing and the good you have accomplished has been fully appreciated. You men are pioneers in this work and I know the people of the University appreciate what you are doing, and will be very glad to co-operate with you in any way that they can.

Mr. Brown: It seems to me that something should be done by our Society along the line of getting protection from the injurious insects. I believe it is time for something to be done and I would suggest that this matter be referred to our Legislative committee with power to act for our Society in conjunction with Professor Bruner. So I move, Mr. Chairman, that our Legislative committee confer with Professor Bruner with a view of going to our Legislature for relief along these lines.

Motion carried.

Meeting adjourned until 9:00 A.M. Wednesday, January 20.

SECOND SESSION

Wednesday, January 20th, 9:00 A. M.

The President: The meeting will please come to order. I believe the first subject on our program this morning is that of the "Outlook for Commerical Orchardng in Western Nebraska," by Mr. Stephens, of Crete.

(Report printed on pages 183-187)

Discussion

Mr. Christy: How about the question of temperature. Does a thermometer drop to 24 degrees mean a loss to the crop?

Mr. Williams: Out at Grand Junction, Colorado, they are now growing timber in their orchards. I believe that unless the mercury falls below 28 degrees there is no need of artificial heat. I would recommend the use of these little coaling stations, about forty to the acre. Out there in Colorado, however, they have abandoned the use of smudging because they can raise timber cheaper in the orchards and in that way insure the safety of their crops of fruit. They have discarded the use of these coaling stations and are growing timber in their orchards be they can secure a better protection and at a much less cost.

Mr. Stephens: While I was out at Grand Junction my attention was called to a little sort of basket fire, whch they used, and they tell me the cost of these little baskets are about seven cents each. Take this closely woven wire, that is about two feet in width, and cut it into squares of about two feet, make the basket eight inches deep and put in it corn-cobs saturated with oil; put the saturated cobs in the bottom of the basket and cover these with coal, and then go around with the proper time with a little oil torch and set the saturated corn-cobs on fire. It can all be done very quickly. The cost they tell me is only seven cents each, and the results are very satisfactory.

The President: I want to remind you that the Question Box is still running. Any of you, whether you are members or not, are entitled to ask whatever question you want to about horticultural matters. Write your questions out on slips of paper and hand them to Mr. Green. Then at the end of each session these will be taken up and read and answered by the different members to the best of their ability. We can have a general discussion on these questions in the question box.

A Member: I just learned this morning for the first time that the school here is publishing an agricultural paper. I understand that Professor Davisson is Editor of this paper, and as he is here with us this morning I move, Mr. President, that he tell us about this.

Motion carried unanimously.

Professor Davisson: Mr. Chairman, I was not prepared for a speech when I came in here this morning, but I will be glad to tell what I can about our paper here at the Farm. I was talking to one of your members here this morning, and he said that your society would be interester in this.

For several years our boys here have had a paper that we call "Agriculture." This paper contains articles each month by our various professors. One month it may be devoted to some particular phase of the school work here at the farm and the next month possibly to another. We have had pitcures of the various buildings here at the farm, from the time the school was started down to the present time. Our last issue contained 125 pages. And now I happen to be the editor and publisher of this paper, and what we want is this, to have the Horticultural Society to take an interest in this and help us out. Professor Emerson and these men here at the Farm are doing a good work, and the people ought to know about it. The salvation of Nebraska depends upon these young men and women of our state who are coming down to the University to school, and we want them to leave here with the right kind of ideas and purposes. I hope to see the time when around every farm home in the state of Nebraska we will have a windbreak. I want to see the time too when we shall not pay too much attention to things material and when we will devote more time to the culture of things beautiful, to the trees, and flowers and grasses, etc. We want to get a good subscription list, and it is growing all the time. The Horticultural Society could do well, say in the issue of our paper which comes out the month before your annual meetings, to have a notice of the meeting and a write-up of horticultural matters in general and also to have your program published, so that the boys and girls here at the farm and out in the state, who receive the paper, would know what is coming and could prepare to come to the meetings. Our paper will be glad to publish any notices of this sort that you care to give us. Now I am going to pass around these little slips, and I want you to write your name and home address on these, and I will do the rest. I'll send you a copy of our paper and you can see what it is.

The President: I noticed Mr. Copeland, of Elgin, who is one of the Regents of the University, is here this morning. He is very much interested in the beautifying of the farm home and landscape gardening in general, and I am sure we would all like to hear from Mr. Copeland about the beautifying of the grounds here at the University Farm.

Mr. Copeland: Mr. Chairman, and Gentlemen of the Horticultural Society, I am very glad indeed to be able to be with you this morning and to exchange a few thoughts that I hope may be helpful to all of us. I am a true lover of nature and of all things beautiful, and I have wanted to get these things brought to the attention of the voters of the state and for them to see what is being done here at the farm and on the campus of the University down town. So the Board of Regents were good enough to turn this thing over to me and they appointed me as a special

committee and gave me certain funds to be used as I wanted to along this line. You have probably noticed the improvements that we have already made upon this campus, and I want to tell you that it is the desire of the University authorities to make this campus the beauty spot of Nebraska, because it is here that the boys and girls of the state come for an education, and we want to send them back with the idea that if there is one place above any other where they will want to return to it is the farms of this state. This, I believe, is going to accomplish much good. We have succeeded in obtaining a splendid man to take charge of these grounds, and he is also in charge of the campus down in the city. As I said before, we want to make this the garden spot of Nebraska, and to train up the younger generation of boys and girls to take the places of these men whose hairs are getting gray.

We propose to hold on the 22nd of next April a sort of anniversary of Arbor Day, and to get some of the old pioneers of this state here at that time and to have a rousing meeting and to get up some enthusiasm and gain new inspiration. I believe this campus would be the logical place for such a meeting to be held. We intend to have an Arboreum here and to have some of the pioneers plant a tree each here on this campus at that time. I know we could get some of Mr. Morton's sons to be here and participate in such a delightful thing. I feel that we should do something of this kind. By a meeting of this nature we could gain new inspiration, fresh motives and the desire to move on to better things. This is merely a suggestion now, and I want to leave it with you. I sincerely hope that you gentlemen will think carefully over this matter and that we can come to some understanding on this idea. I thank you for the privilege of speaking to you.

ELECTION OF OFFICERS

The election for officers for the ensuing year as taken up, and resulted as follows: President, C. H. Green, Fremont; First Vice President, W. A. Harrison, York; second Vice-President, Ed. Williams, Grand Island; Treasurer, Peter Youngers, Geneva.

The election of a Secretary was left with the Executive Board to be chosen at a later meeting.

Mr. G. A. Marshall was elected to fill the unexpired term of Mr. W. G. Swan for the following three years on the Board of Directors.

Mr. C. S. Harrison: In regard to the Experiment Stations. No appropriations have been made for the past two years. Only a small amount, about \$20.00 a year would help us a good deal. We are going ahead with the work just the same; a great many important experiments are being carried on, and new discoveries and new creations are being brought out, but a little help would be greatly appreciated.

Question: Do these appropriations for the Experiment stations come from the funds of the Society?

Answer: Yes, sir.

Mr. Marshall: I am sure the experiment station at York is giving us \$20.00 worth every year. Mr. Harrison has experimented very extensively along the line of ornamental plants and flowers.

Motion made carried that the matter of appropriations for the Experiment Stations be left with the Executive Board, with power to act.

RESOLUTION

The following resolution was read by the Secretary, and adopted:

Whereas, Recognizing the value of proper facilities to carry on instruction along all lines of agriculture; and,

Whereas, Additional accommodations on our State Fair grounds, where the value of objective perfection in animals, crops and manufactures 's best imparted to our farmers in a short space of time, and improvements as asked for by the Regents of the University on the State Farm, where our boys and girls receive the practical instruction which fits them for successful farm life, will be petition from this Legislature; therefore be it resolved,

That we heartily endorse such improvements as are asked for the State Fair grounds and State Farm, and request our Legislators to appropriate sufficient money for such structures as will be a credit to the state of Nebraska.

QUESTION BOX

No. 1. How do you prepare the beds for tulips, daffodils and lilies?

Mr. Williams: For tulip beds I manure quite freely. Spade down good and deep and then set your bulbs in at a certain depth. My experience has been that with tulips, hyacinths, etc., about four inches below the surface is all right. If you put them down so the tops will be about four inches below the surface I think they will come out all right. Never cover your beds too soon in the fall. Wait until the ground is frozen thoroughly before your put the top dressing on. Then a good covering will keep the ground frozen all winter. And when you take the top dressing off in the spring don't be in too much of a hurry to do this. Leave the covering on as long as possible.

No. 2. Will grapes after bearing one year and then winter killed to the ground do any good again?

Mr. Harrison: Yes, cut the tops of them off to the ground and they will be all right.

No. 3. What is the cost per acre of protecting orchards from frost by means of coal or of crude oil?

Mr. Stephens: As I stated before, the people out at Grand Junction, Colorado have found that planting timber in the orchards is better and also cheaper as a protection from frosts. They do have coal oil stoves, though, made of sheet iron, with the top open. In order to be effective at all it is necessary to have about forty stoves to the acre, and I believe they say these stoves cost \$16.00 to the acre.

No. 4. What is the best all around strawberry for Nebraska? Answer, Senator Dunlap.

No. 5. What variety of Lilies should we force for Easter?

Mr. Henderson: For myself I would use the Heresie Gigantum.

Mr. Williams: I would like to heartily endorse the Gigantum. We have been growing that and the other varieties too, and the Gigantum is certainly good.

No. 6. What are the best lilies for outdoor planting?

Mr. Harrison: The Rubrum does fairly well; and the Tigurnus, single and double, are all right, and the Superbum, too.

Mr. Green: I have had good success with the Oratum and Candida.

No. 7. What shall we do to protect ourselves against the dishonest tree salesman?

Mr. Yager: I'll tell you. First of all, pay \$5.00 and become a life member of this society, get our reports and bulletins and all the literature that we publish and study it. Read our horticultural papers and bulletins and get in touch with our horticultural meetings and the honest nurserymen here at home. That is what our society is for. Our of our objects is to protect the people against this class of salesmen.

Mr. Brown: I have been a nurseryman here in this country for a number of years, and I believe that the nurserymen themselves are as well behaved and decent as other people. And as brother Yager says, get in touch with the members of our society, and most of them are the nurserymen of Nebraska, read our reports and bulletins and get an intelligent understanding of the nursery business in Nebraska.

Mr. Williams: I believe it is a very good idea to read the reports and bulletins, etc., but in addition to that, I think we should go further. I think that we should have every man who poses as a tree agent put on record, require him to have a certificate showing that he is competent by training as a horticulturist and also showing that he is all right morally too. I think every tree agent should be competent and able from every standpoint to sell trees.

RESOLUTION

The following resolution was read and referred to the Legislative committee.

Lincoln, Nebr., Jan. 20, 1909.

To the Nebraska State Horticultural Society:

Gentlemen:

By resolution of the State Bee Keepers' Association a committee of five has been appointed to serve for two years, to consider means of securing legislation of mutual benefit to the horticulturists and bee-keepers of this state. This resolution comprehends an invitation to your society to appoint a similar committee to confer with ours; which invitation is hereby extended in the earnest hope that it may meet with your approval and favorable action.

Yours very truly,

STATE BEE KEEPERS' ASSOCIATION.

(Signed) A. A. Warner, President,
Frank G. Odell, Secretary.

EXPERIMENTS WITH PHLOXES

NOTES FROM THE YORK EXPERIMENT STATION

C. S. Harrison, York.

The Horticulturist has no patent on his invention. It is generally considered that what he finds out is public property. If good old Mother Nature gives some pointers they belong to everybody. So the sum of these experiments going into the general fund of information makes it possible for the layman as well as the professional to become an expert. As the result of our researches, we are happy to say that even little girls are enthusiastically engaged in developing flowers of new and rare beauty. This bulletin, the result of years of observation, is designed to aid the nurseryman as well as the amateur and it should be a great help in home adornment.

In the tremendous advance of horticulture we are not to lose sight of the susceptibilities of the phlox.

There are two ways for the improvement of plants. Save the seeds of the best, give the plants the best possible care, keep sowing seeds of the very best year after year, and you are sure of some gain.

Another way is to hybridize or cross the different kinds, then select the very choicest. The last is the surest way of success. As like begets like, there will be no very striking variation, so the former process is slow. If you raise lilacs from seed for instance, and have only the *Vulgaris* or common kinds to work on, you cannot make much head-way. If on the other hand you have twenty kinds planted close together and the bees mix the pollen then you are doing something. We have several new sorts secured in this way and hope for some satisfactory results.

When you begin to hybridize there is a tendency to revert to the original types on one side or the other. But as you proceed, you get

further and further from the parent, and your new creations launch out into a wild abandon of beauty, and give you a prodigality of loveliness. Now you are ready to do something worth while.

When Professor Dahl discovered the flower down in Mexico which now bears his name, the blossoms were single. It took a long time to secure a double form. Now we have several large and distinct families. The Show family has three groups. The New Century Dahlia has three more. Then come the fancy, the collarette, the pompon, and the cactus groups, with the numerous forms of single ones. These separate kinds are now so diverse from the parent stock, their own mother would not know them.

The same advance has been made with the carnation. A single one of these glorious flowers sold for \$30,000 and that was but the commencement of its career. Like advance has been made with roses. My friend, Professor W. A. Harshbarger of Washburn College, Topeka, has ransacked the earth and now has 220 kinds in his garden. When we come to the phlox no such care is now necessary. Originally it came from America, where like a wild Indian maiden it flourished untamed. It was then sent to Europe where under the care of expert florists it came forth a princess with robes fit for a king's palace. As such she comes to us, now far removed from the native type, ready for amazing transformations. The phlox planted in masses is one of the most impressive features of the landscape or flower garden. A group of a thousand seedlings with that wonderful blend of color is a very attractive spectacle. Planted in beds in separate colors it is very conspicuous. I am more and more impressed with the fact that there are surprises of beauty yet to be evolved from these winsome flowers.

Local and Climatic Influences.

Phloxes should be sheltered from our fierce, hot winds, and if possible in a dry time they should be well watered. If you cannot do this then irrigate with the hoe and cultivator. Never plant on a ridge but in a deep depression or shallow furrow. If you plant Irises too deep they will rot. Phloxes should be put in so the buds will be about two inches below the surface.

In the summer as the hot dry weather comes on, you can put more earth around them, making them deeper rooted. This is especially necessary in field culture where with good cultivation they will do fairly well without irrigation. You will be surprised at the effect the weather has on them. If hot and dry, your flowers will be of lighter color, and very much smaller. You may have some, the single flowerets of which are larger than a silver dollar in moist weather, but when hot and dry they will be the size of a quarter, and perhaps not larger than a dime.

Phloxes do much better in Minnesota than in Kansas. They love cool moist air. The colors are much brighter in fair weather. Out in Colorado I saw some *Crepuscles* which had blooms of dark lavender.

I told the owner there must be some mistake. He said, "No." When I got home mine were clear white with crimson eye. A few weeks later we had cool wet weather, and mine had exactly the same colored blooms as those in Colorado.

They never should be planted on stiff clay land. The roots cannot penetrate the clay, and if they do, when you come to dig them if the ground is dry the hard clay will retain the roots. A sandy loam is the best, but our rich prairie soil does well enough, especially if not infested with angle worms, for these pests change our fine and pliable earth into a stiff adobe. If grown on rich ground you will have a fine root system. Some kinds will do much better in some localities than others. Etna, Coquelicot, LeMahdi, and many others may do well in the more congenial soil of England and the Atlantic states, but they are absolutely worthless west of the Missouri river. Here we must have something that will endure our climatic changes. Some kinds are sure to blight in wet weather, and some will completely burn up when it is very hot and dry. So the florist is often blamed when plants do not do well, when all the damage should be charged up to the weather man.

Again cultivation has much to do with success. If plants are left to utter neglect they cannot do as well as with the best of care. Above all avoid having them go in partnership with weeds. These make bad landlords, often exacting one-half and sometimes taking all. If you must have weeds, keep them by themselves.

The Time of Planting.

This depends largely on the condition of the ground and also of the plants. This year we planted very successfully in July and August. The ground was in fine order, and we took a ball of earth with the roots and they did not seem to know they were moved. Sometimes we left the flowers on, but it is better to cut them off, leaving stems to about six inches in length. In September these short stems were throwing out shoots in fine order soon after planting. August planting may do at home when you wish to change from one bed to another, but it would hardly do to ship from a distance unless you get potted plants which are sent with a ball of earth and can be shipped at any time.

Experimenting.

Probably no one in America has given more attention to phloxes than ourselves. For years we have been raising seedling phloxes grown from seed of the very choicest. These show up well with the imported ones growing beside them. But we want the very best, so we do not venture to save more than one in a thousand. These are watched very closely to see if year by year they will bear all the tests of our trying climate. They must grade up to the five points of excellence. (1) There must be a symmetrical head. (2) We want a continuous and prolific bloomer. (3) The plant must have a robust constitution. (4) Ability

to resist the blight and hot weather. (5) We want a rapid multiplier, one that will stool readily and also bear an abundance of seed, one in fact, greatly interested in the business itself.

Many plants have fine individual flowers, but they do not have a good crown. We want them to match and blend into a symmetrical head, so that on the stem in the garden, or in the vase they will seem like one large flower. We want something doing from July to November if possible.

There are some sorts which will flower gloriously for a few weeks, and then go out of business. Sometimes we pardon them for not coming up to all the specifications, but if possible we want all the demands met in every specimen.

A good strong constitution is a very important factor. A delicate Boston bred woman does not transplant well out on a bleak prairie, where instead of living in a palace she must have her home in a sod house. So some plants are almost human in their sensitiveness and cannot endure the privations of the "wild and woolly west." They do not like to be whipped by our siroccos, and cuffed by the storms. Give us something robust as well as beautiful, like the Grand Old Enclaireur, Richard Wallace, Lepole, Nord, Pearl, and Independence.

Again there must be the ability to withstand the blight in wet weather, some varieties are so sensitive they will be wiped out altogether. Sometimes it does rain in Nebraska. Last summer a cloud burst poured a flood three feet deep over our phlox beds, but the hardy ones did not mind a little thing like that. Some sorts will do well in the early summer, and succumb to the heat of August.

My associate went out with me to select some choice specimens for naming and propagating. Among the seedlings there was one clump of very rare delicacy and beauty. The flowers were white, washed with the faintest tints of pink.

The florets were large and the head was fine. Not to subject these beauties to too much hardship to tide them through the hot and dry spell then coming on, I dug a trench around them and poured in a pail of water, and when the water soaked away, I drew over the wet ground some dry earth. This ought to have carried them through. Three weeks later they were so badly scorched, and so nearly dead they were discarded altogether.

Again some kinds are not very profitable to the grower, because they multiply so slowly. Fraulien von Lossburg, Queen of the Whites, Esperence, Lamartine, Amphitryon and LeMahdi, with many others are very unprofitable to the grower. They will not increase by divisions, and in three years a plant may not have more than a single stem.

It works like this: You get a lot from an eastern grower. Generally they are so small your customers do not like them. You must plant them out and let them grow a year and then you are expected to sell them at the same price you paid for them.

Perhaps the very price list from which you selected them is thrust in your face, you are told to match it. Now in planting you are by no means sure of your number. The plants were small, some of them feeble and perhaps you loose half of them. You are sadly out of pocket every time your plants have no sympathy with you, and will not help a particle. Perhaps they are white grubs in the ground. Always look out for these pests. Better fork over and pulverize the soil, and kill every one. One year they destroyed \$1,000 worth of evergreens for us.

Never kill a garden mole. These little underground workers are the best friends you ever had. I consider every one in our grounds worth a \$5 bill. You say they ridge up the ground and lift the plants. Then stamp the earth down again. They wouldn't be there if they were not wanted. They are death on the grubs. They never eat vegetables, they always take grubs and worms. How grateful I have been to see those tell-tale ridges where those little white rascals, never stopping to count the cost, would ruin my choicest plants.

A profitable plant seems to understand the multiplication table, and is anxious to help you out. Take that beautiful, early, hardy, dwarf white phlox, called Pyramid from its shapely crown, what a prolific bloomer, it is covered with a mantle of white—a mass of them looks like a drift of snow in June. They stool out at a great rate, we often get a dozen divisions from one plant. When you dig thrust your spade half way down, then turn so as to cut off the lower ends of the roots, and late in the spring each tiny root throws up a head and perhaps you get 25 or 30 more. These you leave till fall, then dig and plant and next year you have fine strong ones for sale.

Zouave, a choice red variety of a somewhat dwarfish habit, has the same characteristics, multiplying with astonishing rapidity. Among our seedlings we are picking out those with these same tendencies. We want those interested in the matter themselves, ready to help out.

A nurseryman wants profit as well as pleasure and beauty. After years of testing I find the Arete a splendid all around plant, one that scores all the points of excellence. The best all around phlox I have yet found. The head a hemisphere, flowers moulded into a splendid crown, plant of great vigor and productiveness. Diana, a pink, after years of trial is doing finely.

How to Produce New Varieties.

When you understand it, it is a simple matter.

First secure the very best, plant them near together, and the bees will mix the pollen and help you out. You can try hand pollenization if you wish, then you know the parentage of your creations, but that is not really essential so you get what you want. There are mysteries in plant life no one can solve. Some plants reproduce themselves, others will not. Pollenize as you will, they pay no attention.

to you. Some phloxes have a marvelous prepotency, impressing themselves in a remarkable manner on their progeny. Crepuscule seems to be the best of them all. The seed of this variety crossed with others gives most gratifying results, the peculiar shape and color of the floret, and symmetrical crown show in a decided manner the parentage. It seeds fairly well, so that it is a prime factor in producing new and choice kinds. I have known it to cross with the tender Coquelicot, giving as a result a much hardier plant of flowers twice the former size. It is a dwarf, and it takes about three years to come to its best. It will often stagger under its great load of beauty. It is a poor multiplier. You must wait till the plant gets age, and then try propagating from the roots. I have often secured 22 plants from one clump in this way. Some phloxes seem very contrary. For instance, you might sow a bushel of seed from Cross of Honor and you would not have one like the parent. Every plant will be of a uniform Lilac color. We got so many of this stamp we have named them Zantippe. A certain white phlox will not give a single plant with a white flower. They are almost all of a uniform slate shaded pink. Mad. Mauret, dazzling scarlet, almost always reproduces itself.

It does not take long to know what you are doing with phloxes. Sow the seed in the fall, cover lightly, see that they do not dry while germinating, and they are sure to grow. They love the freezing and thawing, the slush and snow, and slop of spring. The little plants will endure almost anything. Never sow seeds in the spring. I never knew them to grow. They refuse to come up in the hot house. If you grow peonies they come up the second or third year and then you must wait from 3 to 5 years, perhaps longer for them to bloom. With phloxes it is different. You sow in the fall and they come up and bloom beautifully in the summer. If not crowded and well watered and cultivated the flowers will be just as fine the first year as ever and they will have a mass of fine, fibrous roots making an ideal plant for transplanting.

A Great Mistake.

Some people order large clumps thinking to secure better blooms. The fact is if left too long the roots get woody and prey on themselves. You dig an old plant, and you do not find fresh and vigorous roots to feed the plant but short stubby and lifeless ones. The best way to raise phloxes for market is to dig, separate, and plant every fall. Then you are sure of good vigorous ones which will give the best satisfaction.

Let me say further, that all the treasures of the earth do not consist of beef and corn, hogs and hominy, wheat and oats. The soul has an inborn hunger for the beautiful. To meet it the good Father has painted his glories on the brow of the storm, and the curtains of the evening glow with splendors which defy the brush or the pen. His are

the treasures of the flowers, so feed the soul as well as the body. You need a flower garden as well as one to supply the table.

Beauty is wealth, so plant it, raise it, care for it, revel in it. Flowers are a prophecy of the future to which we go. They unite the two worlds. Have something of a paradise while you live here.

THE BEST TWELVE ORNAMENTAL SHRUBS FOR HOME ADORMENT.

J. H. Hadkinson, Benson.

To the members of the Nebraska State Horticultural Society and visitors:

Being invited by your secretary to present to you a few remarks on the best twelve shrubs for Nebraska, I will now proceed to enumerate these to the best of my judgment through general practical experience.

You must all be guided as to location of planting these by the recommended list of the State Horticultural Society which is always found in the annual *report.

*I will try to confine myself to just the twelve varieties, only transgressing where I find a good relative in a family.

Do not run away with the idea that this is a full list for landscape planting, because the size and growth of these mentioned would not permit of systematic grouping for this we might add others of smaller growth also perennials where climate conditions would permit choosing hardy varieties.

The list named are for general planting on home grounds by the home person. I will now give a list with height, when matured, time of flowering, and remarks:

Spirea Van Houti, six feet, June, a fine shrub, semi-pendulent growth with white flowers generally covering the foliage from view and commonly called Bridal Wreath, though this belongs properly to the **Spirea-prunifolia**, seven feet May, a little earlier than **Spirea V. H.**, double flowered erect growing true Bridle Wreath.

Mock Orange, **Philadelphus Coronatus**, eight feet May, a popular shrub.

Philadelphus grandiflorus, June ten feet, large flowered with reddish bark this shrub needs no recommending for it is a good standby.

Flowery Almond, a shrub you all know, six feet April. Flowers appearing before the foliage, one of our garden standbys.

Snowball, **Viburnum Opulus Sterile**, ten feet June, an old friend which needs no comment its hardiness and masses of white flowers recommends itself.

Lilac, **Syringa**, ten feet May. I will name three varieties the **Vulgaris**

Note. *The Nebraska State Horticultural reports are obtainable from the Secretary, at Capitol Building, Lincoln, Nebraska.

common lilac colored. **Vulgaris alba**, white and the Persian, which are three good old varieties, the Persian having smaller foliage and darker flowers than the common variety.

Hydrangea Paniculata Grandiflora, six feet August, this shrub with its large bell like flowers needs no comment if cut back yearly and well fertilized the result will surprise you.

Tamarix Amurensis, eight feet June to August, a shrub with graceful foliage flowers of pale lilac color the more you cut this back the prettier the shrubs.

Caragana or Siberian Pea Tree, six feet summer. A very hardy shrub with yellow flower, foliage resembles the garden pea.

Acacca, Moss Locust five feet early spring, a shrub which needs no comment on hardiness, its early flowering makes it valuable though it spreads where planted.

Berberis Vulgaris, eight feet June (green), **Berberis Vulgaris folus purpureis** (purple) seven feet June. These shrubs are hardy and the foliage of each recommends them.

Weigelia Rosea, six feet June and July, red. **Weigelia Candida**, six feet June and July, white. Although these shrubs are not perfectly hardy in the regions of a severe winter they deserve a place in the shrubbery collection.

Golden Bell, **Forsythia**, six feet April. The yellow bell like flowers appearing before the foliage gives this a desirable place in the list.

Prunus Japonica, Japan Quince, five feet April. The early flowering of this shrub gives it a recommend. Flowers red like apple blossom

While I have enumerated twelve shrubs and described them I would further recommend for your consideration and trial the following.

Prunus Friloba, double flowering plum, five feet May, a good acquisition.

Elaagnus Augustifolia, Russian Olive twelve July, a tree shrub with silvery foliage and yellow flowers with perfume equal to the wild grape.

Prunus Besscyi, Rocky mountain cherry, five feet May, very free bloomer.

The writer could go on enumerating shrubs to a greater extent, but this is written for the general home planter without regard to grouping effects, etc., and curtailed so that the planter would not be too much confounded when feeling he wishes to plant a few shrubs.

Plant shrubs, beautify your home surrounding, make life worth living, is the writer's appeal to you one and all whether in city or country but mostly in country, where they harmonise with nature's surrounding beauty.

A payment of \$5.00 for life membership gives you these reports and all bulletins free, which are sent without asking, to your door.

FOREST TREES ADAPTED TO HORTICULTURAL DISTRICT NO. 12.

D. C. Bliss, Minden.

District No. 12, comprises the six counties of Adams, Kearney, Phelps Webster, Franklin and Harlan. Forest trees adapted to this district might largely be recommended for Districts No. 5, 11, and 13, so nearly contiguous to No. 12. Most of this is known as upland level prairie, with the exception of the small territory or tract in the northern part of Kearney and Phelps counties, through which the Platte river runs, also the southern part of the district which is occupied by the Republican river which runs along the entire southern boundary.

Tree planting in this western and central part of the state either of forest or fruit in comparison with the eastern portion is much behind what it should be for various reasons. The newer the country the more the inclination of the settler to devote his time and energy to the growing of that which can be the most quickly converted into money. Hence but little thought is given outside of the growing of corn, wheat and oats and other grains. Hogs, cattle and horses also come in for their share of attention. The farmer sows his wheat in the fall or spring and in July following reaps his crops and hauls his products to the elevator and gets his money. Plant corn in May and in six month's time have the matured product. Hogs, horses and cattle have a money value at any age. Impatient for quick results. Must have money at once with which to buy more land on which to grow more corn and wheat so as to buy more hogs and cattle, and then more land and more land. Too impatient for results. The planting of trees and beautifying of homes can wait. This condition of things is not especially peculiar to Nebraska, but to some extent exists everywhere. Immigration travels westward and with it as time passes, the desire to keep pace with the east increases. Conditions and climate changes. As people become more independent and better informed, a different policy is often pursued. As we pass over the country from year to year a gradual change is observed in the planting trees. As a rule more improvements are noted in cities and towns than in the county. The real value of trees depends to a great extent upon the place they occupy. I have in mind in the city of Minden a Linden or Basswood planted by the writer 18 or 20 years ago, occupying a position midway from the street to the bay-window, which spreads largely over the south side of the house. This individual tree is worth and adds more than \$100.00, to the residence property, and probably would not be removed by the owner for that sum. If this same tree stood in the forests of Wisconsin where the writer spent many years in ante-bellum days, its value would depend on how many rails could be split

from it. Shade-trees planted along the walk in cities and towns that are naturally devoid of such trees, should be encouraged as they not only add value to the premises where they are planted, but affords shelter, shade and comfort. A more uniform system of planting should be observed, both as to the variety of trees and size of same. People have different ideas about these things, and what one man likes as to variety, another does not like and as to size, what one would call a switch, another might call a saw-log. We believe our Nebraska statutes allow in the government of cities and towns village boards and city councils the right in the laying out of the same, to plant uniformly over such town or city upon the streets there of trees and to tax the expense of the same to the lot or lots upon which they are planted. Had this been done 25 or 30 years ago, in cities and towns of Nebraska, laid out at the time and properly cared for, the same cities and towns would now present a different appearance, and a commercial value much increased. For such planting there is no variety of trees so well suited to the purpose as the "Old Settler's Ellum." This tree can be grown successfully in nearly every part of the state and will adapt itself to almost any soil or climate. As a shade tree for the street this should be planted liberally. The rapidity of growth depending largely upon the care given to it. But with plenty of moisture and good cultivation may be said to grow rapidly. The common soft Maple also should be included as one of the most desirable for street planting. This makes a nicely formed tree if properly pruned and headed. It is a tree somewhat easily broken down in severe wind-storms if limbs are allowed to grow out of shape. The Hackberry also where planted meets with favor. Just why more of these trees are not grown in the nurseries of the state I do not quite understand. In many sections over the west for street planting large numbers of the so-called "Carolina Poplar," and in many instances the common Cottonwood in place of them and sold by agents or dealers and recommended by them on all sorts of grounds as the tree to plant. We think as time advances we shall find in a few years that for a permanent tree it will be found a mistake to plant liberally of this variety. Many people think only of the rapidity of growth overlooking more desirable qualities. These have only been introduced within the last few years and have reached no great size. The Poplar like the Cottonwood will doubtless prove to be a great robber of the soil, and will interfere with the growth of anything planted near it. The growth of all the above varieties will be much increased by a liberal supply of water and cultivation. During the years from 1878 to 1891 inclusive, a short period of thirteen years, while the timber culture law was in operation, in nearly every section of the state were planted to the extent of 27,000 trees. Had all these ten-acre lots of trees planted at that time grown and were alive today, what a forest we now should have had. To fill the demands of the law all kinds of deciduous trees, seeds and cuttings were planted. But few people planting these claims ever expected to grow tree to maturity. About the only variety of trees planted at that time upon our western prairies

remaining today is the common Ash. We find here and there groves of ten arce of Ash thirty years old with no larger growth than might have been made in one-third of that time had one-fourth of that number been planted on the same amount of ground, and properly cared for. We believe that in framing the Timber Culture law of 1878 the makers of the law made what afterwards proved to be a mistake in requiring the trees to beplanted four feet apart, and also in allowing seeds and cuttings to fill the requirements.

Wind-breaks

We believe every farm home, when first laid out, should be entirely surrounded by trees for the protection not only of the residence but made to take in barns, sheds, hog-lots and orchards and should enclose at least five acres of land. Several rows of trees should be planted for this purpose. I should recommend Elm, Ash, Honey-Locust, Russian Mulberry and Hackberry for upland. In addition to the above for bottom or river land, Cottwood, Carolina Poplar, Maple, Box-Elder and Linden. A valuable tree which has been much neglected is the Black Walnut. The writer visited a grove of this variety on Wood River a year ago, the same having been planted about twenty. Some of these trees now stand from 50 to 75 feet in heighth, and some of them nearly one foot in diameter. These trees are straight and finely formed and the only grove of its kind seen in the west. These trees have been persistently trimmed from year to year until they assumed their present form.

REPORTS FROM DIRECTORS OF FRUIT DISTRICTS.

REPORT FROM DISTRICT NO. 2

G. A. Marshall, Director

Mr. President and members of the Horticultural Society, Ladies and Gentlemen: In giving report of District No. 2, which consists of the following counties, Cass, Sarpy, Douglas, Washington, Burt, Dodge and Saunders, I wish to say that the past season has been one of extremes, both as to heat and cold, wet and dry. The warm March and fore part of April brought the trees in bloom early, then the noted cold wave that followed, did its destructive work and came the nearest putting us out of the fruit business that we have ever been before since our country has been old enough to produce fruit. Apples and plums suffered the most. The estimated results of the damage is about as follows:

Apples 10 per cent of crop, plums less than 5 per cent of crop, cherries 25 per cent of crop, Peaches 10 per cent of crop, grapes 50 per cent of crop, blackberries 50 per cent of crop, raspberries 30 per cent of crop, strawberries 60 per cent of crop, currants and gooseberries 15 to 20 per cent of crop.

We had the wettest weather in June we ever experienced, yet the blackberries and cron crop was cut a little short by dry weather in July.

The old maxim, "One extreme calls for another," was surely true in the past season. The cherry, plum, peach and apple foliage was in pretty good condition this fall, and the fruit buds seemed to be well developed and went into the winter in apparently good condition. Also, the raspberries, blackberries and strawberries. The grapes were more varied, however. Some vineyards are all O. K., while others are in a somewhat weakened condition, caused by extreme wet and from fungus development. I believe the recommended list of fruits, especially apples for the various fruit districts is somewhat misleading. For instance, in District No. 2, we recommend fourteen varieties of summer apples and place them on an equality, while we know that some are more valuable than others. The Autumn list contains twelve varieties while we can recommend all these as hardy and worth planting, yet we know that the same is true of these also. For instance, we called the Plum Cider as valuable as the Wealthy, etc. Were I to plant an orchard of 100 trees in this district I would prefer the list made up about as follows:

2 Yellow Transparent, 3 Duchess, 2 Chenango Strawberry, 5 Grimes Golden, 5 Wealthy, 5 Utter, 2 Maiden's Blush, 2 Ramsdell Sweet, 5 Jonathan, 15 Windsor, 20 Ben Davis or Gano, 5 Wine Sap, 10 North Western Greening, 10 Salome and 5 Janet and for crabs I would place 2 Whitney, 1 Forence and 1 Hyslop.

REPORT FROM DISTRICT NO. 5

E. F. Stephens, Director

We regret to report that this portion of the state was again visited by a cold wave, of such extent and character as to do more harm than the cold wave of 1907. In 1908, the damage was increased by the long continued cold wave. The cold, raw winds, day after day, checked the flow of sap and at night-fall the mercury dropped several times to freezing point, or below. The greatest measure of harm was suffered during one morning about the close of cold wave. Watching our thermeters, the night before hand at nine o'clock, we noted a rising temperature and were confident that we should escape harm that night. At four o'clock in the morning, no harm had been suffered. The temperature at that hour was just about thirty-two, above freezing point. Up to this time our own orchard had been protected by clouds, which lessened the radiation of earth's heat. At this hour on this particular morning, the clouds cleared away and the temperature rapidly fell until at six o'clock, the thermometer showed a temperate of twenty-four. The sun rose clear and bright, the temperature rose rapidly, the buds of fruit thawed quickly, resulting in very serious harm.

The question of the measure of damage by the cold wave, is in the opinion of our Mr. Walker, who has lived in the orchard twenty-four years and observed closely, determined somewhat by the circulation of the sap, existing in the trees at the time of the cold wave. Mr. Walker mentions that in 1894, the thermometer fell to twenty-four degrees on the night of May 19th, resulting in serious harm to our orchards on the very lowest levels, but leaving us a full crop in our orchards on the higher levels, notably what we call our southeast orchard. Mr. Walker's explanation of this curious result, is that at the time the cold wave of May 19th, the trees were in vigorous growth, there was a full and strong circulation of sap, apples were perhaps the size of hazel nuts. The circulation of sap in the tree, being very strong, apparently the fruit was thawed from within before it could be thawed by the warm rays of the rising sun. Mr. Walker has noticed in watching the behavior of different varieties of trees that trees which at the time of the cold wave have a vigorous circulation of sap, suffer less than trees which at the time have a less vigorous circulation. The Sweet June sometimes saves a considerable proportion of its fruit under conditions entailing loss in other varieties nearby.

At the close of our freeze in 1908, we had been having a number of days of cold, raw wind, checking the circulation of the sap in our apple trees; under such conditions, circulation having been nearly paralyzed by a cold wave, lasting four to six days, there was not at the particular time at sufficient circulation of sap to assist in drawing the frost before before the frost could be thawed by the rays of the rising sun.

North of us and in town, there was less harm from frost, and we learn that in other districts, trees and plants suffered much less under

the shelter of buildings and trees in town than out in the country orchards. Trees planted on very high table land, particularly so located that cold air could roll away to lower levels, suffered but little. We were able to pick 310 bushels of Grimes Golden apples from a few feet less than two-fifths of an acre. Curiously, on level land, a little higher and not far away, the crop was lessened by this cold wave, leaving us perhaps a half crop in that division. In some neighborhoods, a fair crop of peaches was secured. Apparently the question of the crop was determined by elevation, protection from the cold wind or other favorable conditions.

In the southern portion of the district, quite a number of peaches were grown and a few apples. We may say, however, regarding the peach crop that the large amount of wet weather in mid summer was very favorable to the development of fungous diseases and where a fair crop of peaches was set on the trees, the results were not as favorable as during the driest summers. Given excellent cultivation, we can retain a sufficient amount of moisture to develop a fair crop of fruit. In case of excessive rain fall, as during the past summer, we are more liable to fungous diseases than during our dry years.

The rain fall here at Crete was thirteen inches in the month of June. Orchards that were well cultivated have come through the season in good condition and the conditions at this time are favorable for a full crop the coming season. The orchards have had a rest of two years, have recovered their original vigor and if the spring can be such as to allow the crop to set, our people will again be encouraged by an abundant crop.

Personally, we felt that the cost of placing fires and smudges would have been well repaid during the past two years, and think it would be wise to prepare for a cold wave the coming spring. Travelling in other orchard districts, we find many localities an almost universal intention of preparing for a possible cold night or series of them, and it is our own plan to make some preparation.

REPORT FROM VALENTINE STATION

C. M. Van Metre, Director

The spring of 1908 opened fine but turned for the worse, all kinds of freezes just kept coming leaving us only the red juiced cherries. They were a fine crop all else a failure.

REPORT FROM SANDOZ EXPERIMENT STATION

Jules A. Sandoz, Director

To the Honorable President and members of the State Horticultural Society:

I am pleased to present you herewith my report of the experiment station you have entrusted me with, and will make it as accurate as

possible, so as to inform intending planters in Northwest Nebraska.

The 4,000 fruit trees now under cultivation have made good growth during the last year, and I have obtained only about half a crop of fruit due to the untimely frosts. As most of the trees have now stood from 4 to 10 years I can accurately describe their behavior as follows:

Cherries

Early Richmond, winter kills; Dyehouse, hardy, best early; Early Morello, hardy, sweet, very valuable; Montmorency, not hardy, slow bearer; Ostheim, hardy but poor bearer; Terry, hardy, valuable; Baldwin, hardy not fruited; Wragg, best late, ripens August 15; English Morrello, same as Wragg but not hardy.

Plums

Sandoz, native, best early; DeSoto, hardy, small tree, live only four to five years; Wyant, best of all American; Rollingstone, hardy, wind-breaks; DeSoto, not quite hardy; Rockford, hardy but diseased plums; Y. B. Rue, not hardy; Wolf, hardy, thin bearer; Klondike, fine, early like DeSoto; Snook, hardy, large coarse plum; Bixley, fine, early, better than DeSoto. All Peaches, Wild Goose, Chickasaw and Japanese Plums winter kill, so it is useless to buy or plant them. Glass Seedling Plum and Green Gage, hardy and bear when grafted on Sandoz.

Pears

Flemish Beauty, Birkett, Warner, Lawrence, Lincoln, Gakowsky, BesseMianka, Duchess, are all hardy and show no sign of blight. Kiefer winter kills.

Apples

Florence, Grant, Martha and Withney are all hardy and bear heavily; also, Yellow transparent, Hyslop, Duchess, Aldenburg, Longfield, Janet, Senator, but Wealthy, Ben Davis, Delicious, Gano, Northwest Greening, and all the Ben Davis family, winter kill.

I therefore recommend for planting for Northwest Nebraska:

Cherries

Dyehouse, Early Morello, Wragg.

Plums

Sandoz, Bixley, Klondike, Wyant.

Pears

Flemish Beauty, Birkett, Warner, Lawrence, Lincoln.

Apples

Florence, Martha, Hyslop, Duchess, Longfield, Senator, Yellow Transparent and Whitney.

All the above varieties will bear fruit on any farm land without irri-

gation, but require clean cultivation like corn. Of small fruit, currants, gooseberries, dewberries, June berries, Cardinal raspberries and Snyder blackberries can be raised anywhere.

I also call the attention of the people that West Nebraska has yet untold free homestead lands, that will raise, corn, cattle and alfalfa, and also all above kinds of fruits, and I think that West Nebraska is better adapted to cherries, plums and pears than the eastern part, with apples a close second. Plums and cherries in four to six weeks later than at Omaha, and can be raised to the extent of 400 bushels per acre, with good selection of trees and West Nebraska will in a short time outdo Colorado because we have better lands and more rainfall.

Thanking you for your past support I am

Yours respectfully,

JULES A. SANDOZ.

Haigler, Nebraska, January, 1910.

Gentlemen of the State Horticultural Society:

In attempting to make a report we feel somewhat at a loss what to say for we have been robbed of our fruit crop for two years in succession by late frosts. However, the trees were not to blame, for they were loaded with bloom each year. While this failure may not occur in many years, yet we cannot help feeling our ardor cooled a little. But should we be called upon to pass through the same ordeal, I believe it would be well to try oil pots or some other material that will create a good smudge, as straw or weeds mixed with stable manure to keep if from burning too rapidly, taking care not to injure the trees. I have been asked many times if I thought this part of the state would ever produce fruit to amount to anything. I have always answered in the affirmative, for good reasons. First, my orchard bore ten crops of fruit in succession, all kinds of apples, making a good showing each year, except Red June which has not been a success. I have sixteen varieties in bearing. Crabs are a great success, I have two transcended trees which have paid me \$45.00 in one year. While I have not had great success with cherries and plums yet some of my neighbors have had good success, and as far as I can learn they are a success throughout this district. I would not advise anyone in my district to plant many peaches, our winters are too changable. I would plant a few, if they do not bring any fruit, they are nice to look at and make a very nice shade, the Crosby is the hardiest. I have found, out of five varieties I have tried we would advise everyone to plant a few trees, each of standard and dwarf pears, they seem to be hardy and make a good growth, the Bartlett is a very good one, there may be others equally good. As far as I can learn grapes are not a success in southwestern Nebraska, they have proven a failure with me. However, I would say to every home builder in this newly settled part of our good state. Plant fruit try a little of all kinds, but let apples and cherries predominate. I am speaking particularly to those in our district where fruit is always dear and hard to get. You will not regret it if you do it properly.

GEORGE WHITE.

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